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Bureau of Land Management
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003

May 21, 1987

Instruction Memorandum No. WY-87-428
Expires 9/30/88

To: District Managers, Deputy State Directors, and Chief, OPA

From: State Director

Subject: Wyoming Standard Mitigation Measures for Surface Disturbing Activities DD 6/15/87

The attached Wyoming BLM Standard Mitigation Measures are being considered for application on all surface and other human presence disturbance activities occurring on BLM-administered public lands in Wyoming. This means that the mitigation measures will be utilized as internal guidance to: (1) serve as statewide standards for use in addressing and analyzing environmental concerns; (2) alert all applicants, permittees, and other authorized users of the public lands and Federal mineral estate (as applicable) to general requirements that must be addressed prior to, during, or after their use; and (3) provide a basis for requiring specifications, stipulations, etc., issued with contract documents, leases, permits, and other use authorizations.

The standard mitigation measures will be used to establish the baseline mitigation criteria for Wyoming BLM land use planning efforts and for environmental analyses (EA and EIS). They will provide the basis for measuring and comparing the environmental impacts of alternative disturbance activities in the decision making and implementation process. When a proposed activity deviates from the criteria established in the standard mitigation measures, the decision to implement or authorize the proposal must be supported by the findings of an environmental analysis. Proposals that deviate from the mitigation measures and thus the land use plan, will require a plan amendment or the proposal must be rejected.

The intent of standard mitigation measures is not to replace existing lease or permit stipulations (Wyoming Oil and Gas Lease Stipulations will not be replaced). However, because all stipulations, based upon the mitigation measures, are automatically integrated into the Bureau Planning System and the environmental assessment process, we believe our legal basis for applying all stipulations will be strengthened. The attached pyramid illustration exemplifies this point and describes the interrelationship for different phases of the mitigation process. Those resource activities currently without a standardized set of permit or operating stipulations can use the standard mitigation measures as conditions of approval or as a baseline for developing specific stipulations for that activity.

We believe that within similar geographical or ecological settings, land use activities should be subject to similar kinds of environmental protection standards. Therefore, it appears that application of the "Wyoming BLM Standard Mitigation Measures" to all land use actions proposed for BLM-administered public lands will assure more uniform mitigation than has occurred in the past.

Review the attached "Wyoming BLM Mitigation Measures" and return your comments or suggestions to Tom Lahti (WY 940) by June 15, 1987. Please refer any questions to Tom Lahti at FTS 328-2251 or Joe Patti at FTS 328-2228.

Hillary A. Oden

2 Attachments:
- 1 - Wyoming BLM Mitigation Measures (7 pp.)
- 2 - Pyramid Illustration (1 pp.)

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United States Department of the Interior

Bureau of Land Management
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003

WYOMING BLM STANDARD MITIGATION MEASURES FOR SURFACE DISTURBING ACTIVITIES

The objectives of the "Standard Mitigation Measures" are to reserve, for the Bureau, the right to modify the operations of all surface disturbing activities as part of our statutory requirements for environmental protection and to inform a potential lessee, permittee, or operator of the environmental conditions present in a given area. The measures are statewide standards for land use planning to be used when addressing environmental concerns and serve to alert the applicant or permittee of general requirements to be met prior, during, or after their use of the public lands.

Use the following measures in lieu of standard and special stipulations previously used during pre-permit activities for all Bureau authorized land use activities in Wyoming. These measures have been written to provide a basic standard format with wording that will allow for the addition of specialized mitigation criteria following the submission of a detailed plan of development, or other project proposal, and an environmental analysis.

1. SURFACE DISTURBANCE MITIGATION MEASURE

Surface disturbance will be restricted in any of the following areas or conditions. Modifications to this limitation may be approved in writing by the Authorized Officer.

a. Slopes in excess of 25 percent.

b. Within important scenic areas identified in a land use plan (Class I and II Visual Resource Management Areas).

c. Within 500 feet of surface water and/or riparian areas.

d. Within either one-quarter mile or the visual horizon (whichever is closer) of historic trails.

e. Construction with frozen material or during periods when the soil material is saturated, frozen, or when watershed damage is likely to occur.

GUIDANCE:

The SURFACE DISTURBANCE MITIGATION MEASURE will be included in all BLM authorizations. The intent is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five (a. through e.) conditions exists, surface disturbing activities will be restricted or prohibited unless or until the permittee or his designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, geographical areas and seasons of concern must be delineated at the field level (i.e., "surface water and/or riparian areas" may include both intermittent and ephemeral water sources or may be limited to perennial surface water). These decisions should be identified and management protection committed in the land use planning documents.

Modification of these mitigation measures must allow for other measures to be applied on a site-specific basis, if necessary, to mitigate the impacts of concern. Waiver of this measure must be based upon demonstration through environmental analysis, plans of development, plans of operation, Application for Permit to Drill, etc., that unacceptable adverse effects to the area or condition of concern will be mitigated or avoided.

GUIDANCE:

These WILDLIFE MITIGATION MEASURES are intended to provide two basic types of protection, seasonal restriction (a and b) and prohibition of activities or surface use (c). Legal descriptions will ultimately be required and should be measureable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a condition for approval of the permit, plan of development, and/or other use authorization. These decisions should be identified and management protection committed in the land use planning documents.

The seasonal restriction section of the mitigation identifies three groups of species and delineates three similar timeframe restrictions. The big game species including elk, moose, deer, antelope, and bighorn sheep all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance during the period of May 1 to June 30 when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie and merlin), bitteos (ferruginous and swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse all require nesting protection during periods between February 1 and July 31. The same birds often require protection from disturbance during the period of November 15 through April 30 while they occupy winter concentration areas.

Measure 2c regarding the prohibition of activity or surface use is intended for protection of unique wildlife habitat areas or values. These areas or values must be factors that limit life-cycle activities (e.g., sage grouse strutting grounds, known threatened and endangered species habitat, etc.) that cannot be protected using seasonal restrictions.

Modification of these mitigation measures must allow for other measures to be applied on a site-specific basis, if necessary, to mitigate the impacts of concern. Waiver of this measure must be based upon demonstration through environmental analysis, plans of development, plans of operation, Applications for Permit to Drill, etc., that unacceptable adverse effects to the area or condition of concern will be mitigated or avoided.

3. Cultural Resource Mitigation Measure

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places, mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 CFR 800 will be used in consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

GUIDANCE

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manual Section 8111 and in the cultural resource permit stipulations. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate Bureau of Land Management archaeologist. If cultural properties on, or eligible for, the National Register are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant's contract archaeologist according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for National Register eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be Bureau approved or Bureau formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in FLPMA, Section 102(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

4. SPECIAL RESOURCE MITIGATION MEASURE

To protect (resource value), the District Manager reserves the right to prohibit activities or surface use (i.e., within a specific distance of the resource value or between date-to-date) in (legal subdivision). This limitation does not apply to extended long-term operation and maintenance of the project. Modifications to this limitation may be approved in writing by the Authorized Officer.

Example Resource Categories (Select or Identify Category and Specific Resource Value):

a. Recreation areas.

b. Special natural history or palentological features.

c. Special management areas.

d. Sections of major rivers.

e. Prior existing rights-of-way.

f. Occupied dwellings.

g. Other (Specify).

GUIDANCE:

This SPECIAL RESOURCE MITIGATION MEASURE is intended for use only in site-specific situations where one of the first three general mitigation measures will not adequately address the concern. The resource value, location, and specific restriction must be clearly identified. A detailed plan addressing specific mitigation and special restrictions on development will be required prior to development and will become a condition for approval of the permit, plan of development, or other use authorization.

Modification of this measure must allow for other mitigation to be applied on a site-specific basis, if necessary, to mitigate the impacts of concern. Waiver of this measure must be based upon demonstration through environmental analysis, plans of development, plans of operation, Applications for Permit to Drill, etc., that unacceptable adverse effects to the area or condition of concern will be mitigated or avoided.

5. NO SURFACE OCCUPANCY

No surface occupancy will be allowed on the following described lands (legal subdivision/area) because of (resource value).

Example Resource Categories (Select or Identify Category and Specific Resource Values):

a. Recreation areas, (e.g., campground, historic trails, national monuments).

b. Major reservoirs/dams.

c. Special management areas (e.g., ACEC, known threatened and endangered species habitat, wild and scenic rivers).

d. Other (Specify).

GUIDANCE:

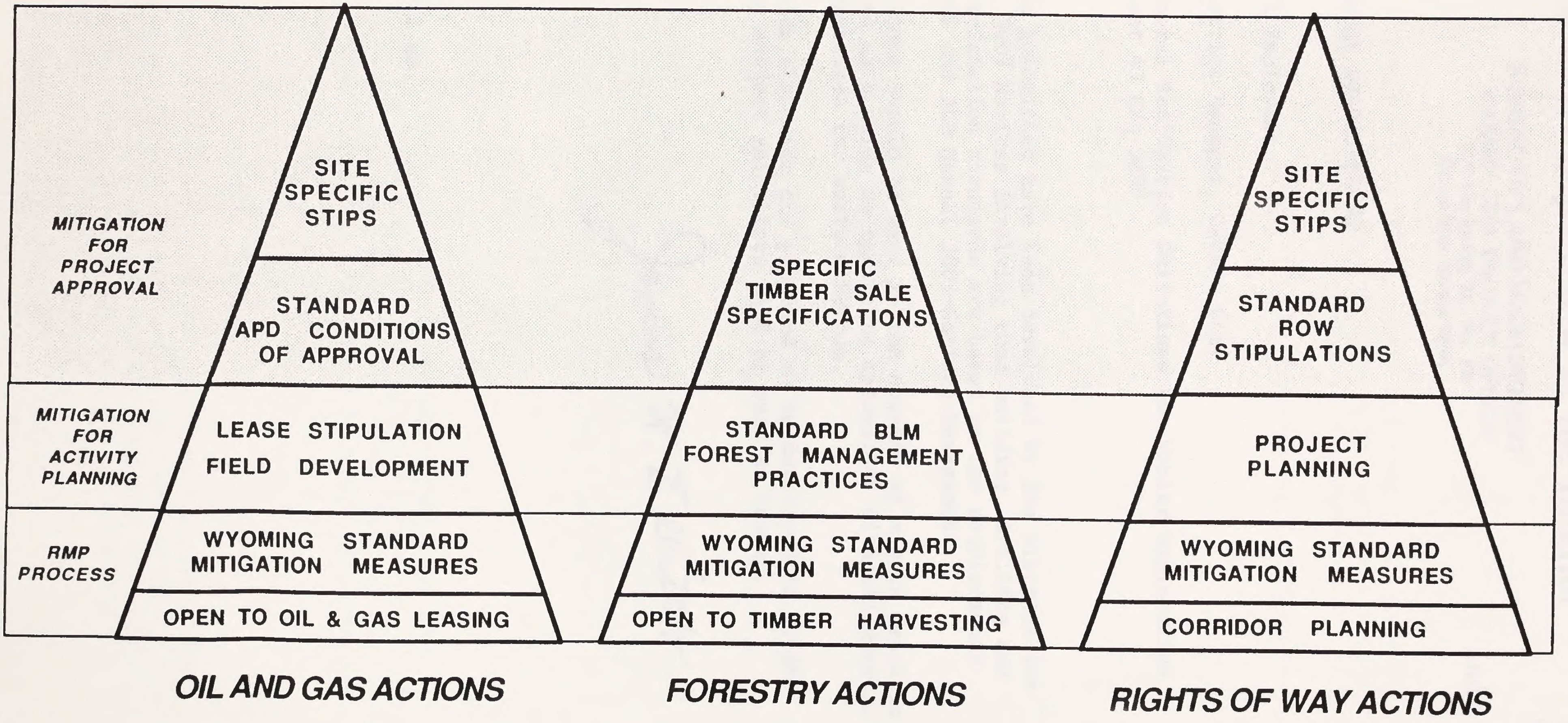
The NO SURFACE OCCUPANY (NSO) MITIGATION MEASURE is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and/or as an alternative to "no development" or "no leasing." The legal subdivision and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of this measure can be granted only with amendment of the appropriate land use plan. The record must show that because conditions and uses have changed, less restrictive measures will continue to protect the public interest or value of concern.

Exception(s) to the NSO measure will be subject to the same test used to initially justify its imposition. If the NSO measure is justified but upon evaluation of site-specific plans of development it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then an exception to the NSO mitigation measure could be granted by the State Director through a land use plan amendment. The record must show that because conditions and uses have changed, less restrictive mitigation measures will protect the public interest or value of concern.

When considering the "no development" or "no leasing" option, a rigorous test must be met and fully documented in the record. This test must be based on stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation measure, the record must show that consideration was given to development subject to reasonable mitigation including No Surface Occupancy. The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A "no development" or "no leasing" decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

MITIGATION PROCESS


MITIGATION FOR PROJECT APPROVAL
MITIGATION FOR ACTIVITY PLANNING
RMP PROCESS
SITE SPECIFIC STIPS
STANDARD APD CONDITIONS OF APPROVAL
LEASE STIPULATION
FIELD DEVELOPMENT
WYOMING STANDARD MITIGATION MEASURES
OPEN TO OIL & GAS LEASING
OIL AND GAS ACTIONS
SPECIFIC TIMBER SALE SPECIFICATIONS
STANDARD BLM FOREST MANAGEMENT PRACTICES
WYOMING STANDARD MITIGATION MEASURES
OPEN TO TIMBER HARVESTING
FORESTRY ACTIONS
SITE SPECIFIC STIPS
STANDARD ROW STIPULATIONS
PROJECT PLANNING
WYOMING STANDARD MITIGATION MEASURES
CORRIDOR PLANNING
RIGHTS OF WAY ACTIONS

The Mitigation Process for Activity Planning refers to the development of mitigation for large projects and the pre-permit or leasing negotiations for more routine actions.

Van Haveren

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CARSON CITY DISTRICT OFFICE
1535 Hot Springs Rd., Ste. 300
Carson City, Nevada 89701

IN REPLY REFER TO:

3809
(NV-033)

July 10, 1987

INSTRUCTION MEMORANDUM NV-030-87-12
Expires: 9/30/88

TO: All Employees

FROM: District Manager, Carson City

SUBJECT: General Reclamation Guidelines for Mining Exploration under 43 CFR 3809

General reclamation guidelines have been developed by the District for inclusion with all 3809 Notices involving road building, drilling and excavating. The reclamation standards are based on the requirements found in 43 CFR 3809 and BLM Manual 3809-Surface Management.

The attached guidelines should be used in the absence of a site specific reclamation plan and as a guide to operators unfamiliar with the general 3809 reclamation practices for western Nevada.

Statewide reclamation standards are proposed to be developed in FY 88. In the interim, the subject guidelines will be used as needed.

James W. Elliott

Enclosure:
As Stated

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GENERAL GUIDELINES
3809
RECLAMATION

A. ACCESS/DRILL ROADS

1. Keep to minimum width needed for safe operations. Grade should not exceed 30%. In steep terrain, track-mounted drill rigs should be considered as an alternative to road construction.

2. Follow the natural terrain where practicable to minimize cut and fill.

3. Stay in dry drainage bottoms as much as possible especially if roads are to be abandoned.

4. Roads that have a grade of less than 6% should be ripped to promote moisture infiltration and revegetation.

5. Roads that have a grade of greater than 6% should be ripped and properly waterbarred (see attached).

B. DRILL SITES

1. Drill in roadways where possible. Self-leveling drill rigs should be considered for steep terrain.

2. All drill holes should be plugged with either cement or a mechanical device at least 5 feet below the surface. Drill cuttings will be disposed of down-hole and leveled with the surface.

3. Drill pads should be regraded to approximately match the natural contour. When pads require a cut and fill construction, the operator may be required to "pull" cast material upslope to aid in recontouring. Topsoil should be saved and spread following recontouring.

C. TRENCHES/PITS

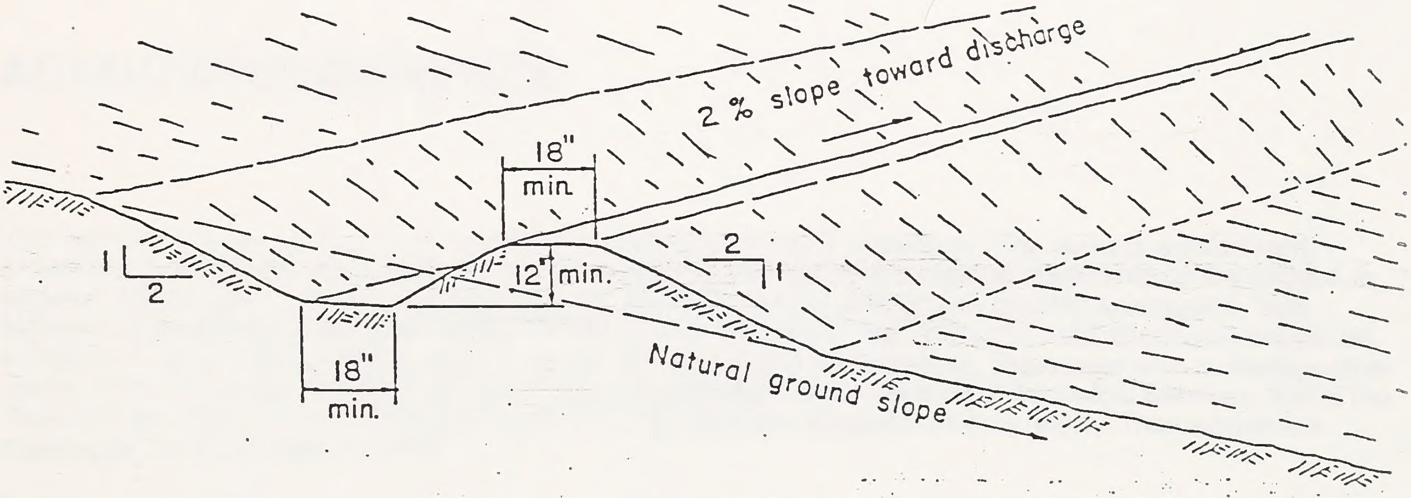
All trenches and pits should be backfilled and recontoured upon completion of sampling and/or mapping. Excavations required to show mineralization may be left open temporarily. Trenches and pits should be constructed so they do not pose a hazard to humans or livestock. Fencing may be required.

D. SEEDING

Seeding requirements are based on a variety of factors including precipitation, type of soils, aspect and slope. Generally, if annual precipitation is less than 8 inches, seeding will not be required. When seeding is required, the District will make recommendations on a case-by-case basis.

WATERBAR SPACINGS :

SLOPE (%)	SPACING (ft.)
0-5	-
6-12	150
13-20	100
21-30	75
>30	50



(waterbars should be angled 45° from centerline of road, min.)

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ACKNOWLEDGEMENTS

This document is the result of a concerted effort by a large number of persons. The authors would like to especially thank Gene Herrin, Gary Bauer, and Tom Lahti for their administrative leadership on the project. In addition, special recognition should be given to Carol Ross for her artistic and graphic assistance, Terri Mitchell for cartographic assistance, Rick Cantebury for his help in the Tip Top oil field, Bruce Keating for his expertise in remote sensing, and Betty Himes for her typing and editing skills. There were also numerous other persons in the Division of Resources, Technographics Section of the Division of Technical Services, and in the Rock Springs District who made significant sacrifices to make this publication a reality. Their advice and assistance are greatly appreciated.

Dennis L. Law, ASLA
Assistant Professor
Department of Landscape Architecture
Kansas State University

Lester L. Linscott, ASLA
Assistant Professor
Department of Landscape Architecture
University of Florida

Richard L. Hopkins
Natural Resource Specialist
Bureau of Land Management
Wyoming State Office

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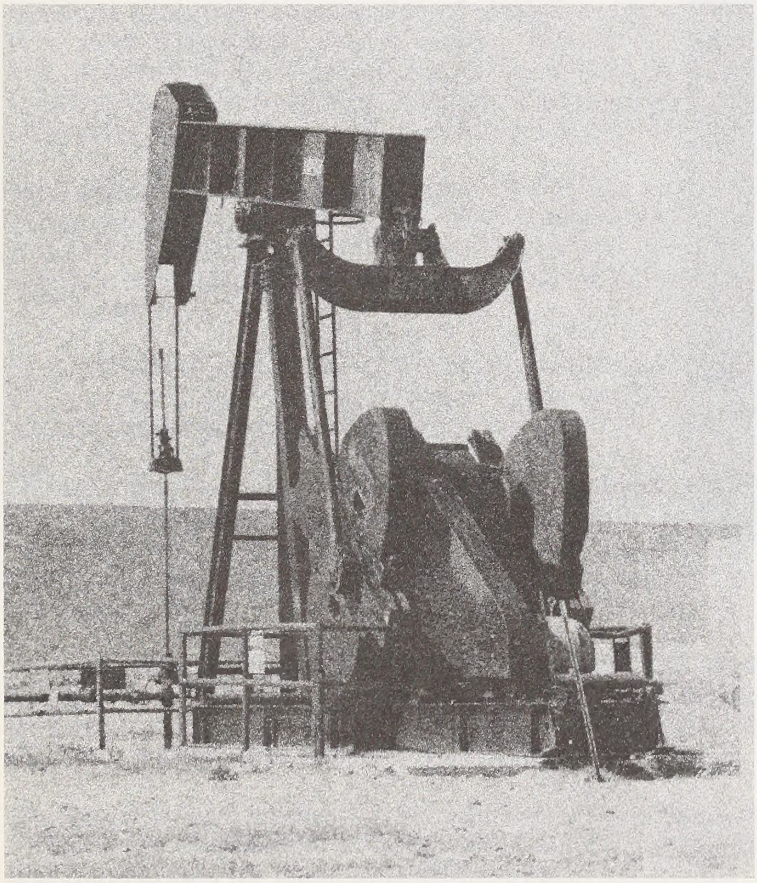
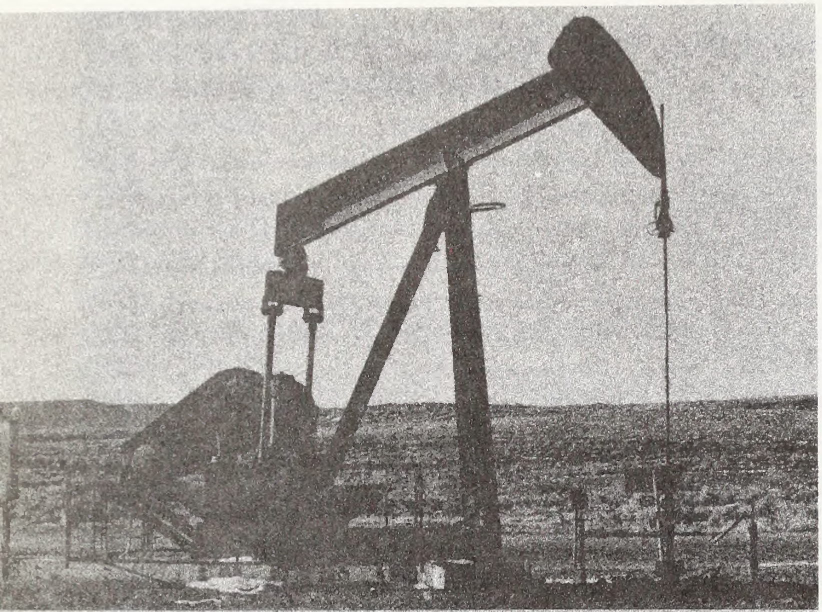
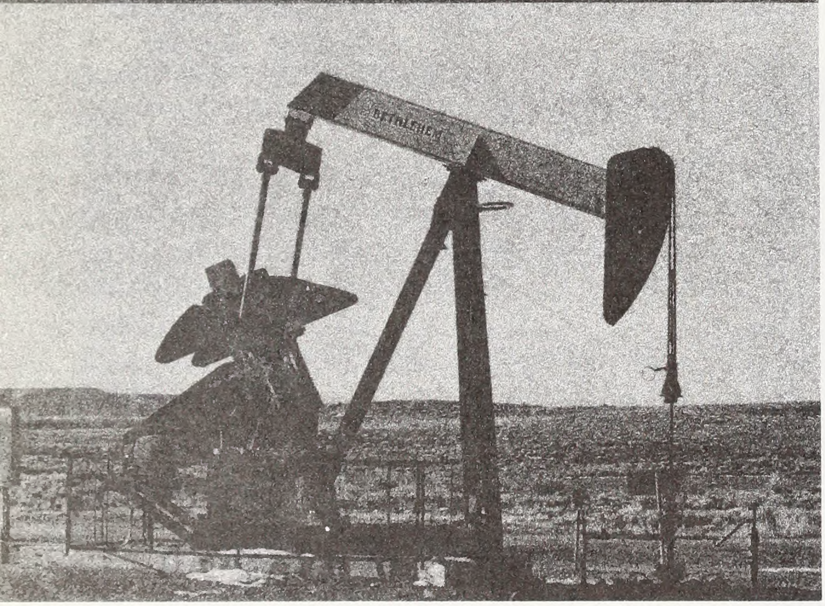






INTRODUCTION

The primary objective of this publication and the process it describes is to establish a procedure for rehabilitation planning for existing oil and gas fields on public lands. Once the guidelines have been established for a particular field and placed in the format described in this document, a plan of rehabilitation has been developed.

This document is the result of a 2-year study in developing a process for effective rehabilitation of oil and gas fields on public lands in Wyoming. **The process is described on the left hand portion of the text and the process as it was tested on the Tip Top Unit is described on the right**. The process is a viable alternative to unorganized, haphazard rehabilitation planning and lends itself to facilitate not only post-drilling rehabilitation, but, also, oil and gas field development planning. It is hoped that the process can be adopted and refined so the Wyoming Bureau of Land Management (BLM) can continue to set the pace for outstanding stewardship of Federal lands, even at a time of expanded energy resource exploitation.

Oil and gas development activity began in Wyoming during the early 1900's. Some of these early fields are still producing. As development increased, little emphasis was placed on surface protection and reclamation of disturbed areas. During 1973, BLM became interested in reclamation within producing fields.

The BLM and U.S. Geological Survey (GS) have complimentary responsibilities in a producing field. The two agencies offer different expertise and the Secretary of the Interior intended for them to work together with the staff they have rather than duplicate activities.

GS is the lead agency in a producing lease or field situation. That agency provides the Department of the Interior's expertise for collection of rentals, royalties, conservation of the mineral, safety, drilling, production, contact with the operator, etc. The BLM is the Department's expertise for management, protection, and reclamation of all surface resources. Unilateral decisions that affect a producing lease or field are not to be made by either agency. Responsibilities require that both agencies work cooperatively with each other as well as the lessees or unit (field) operators.

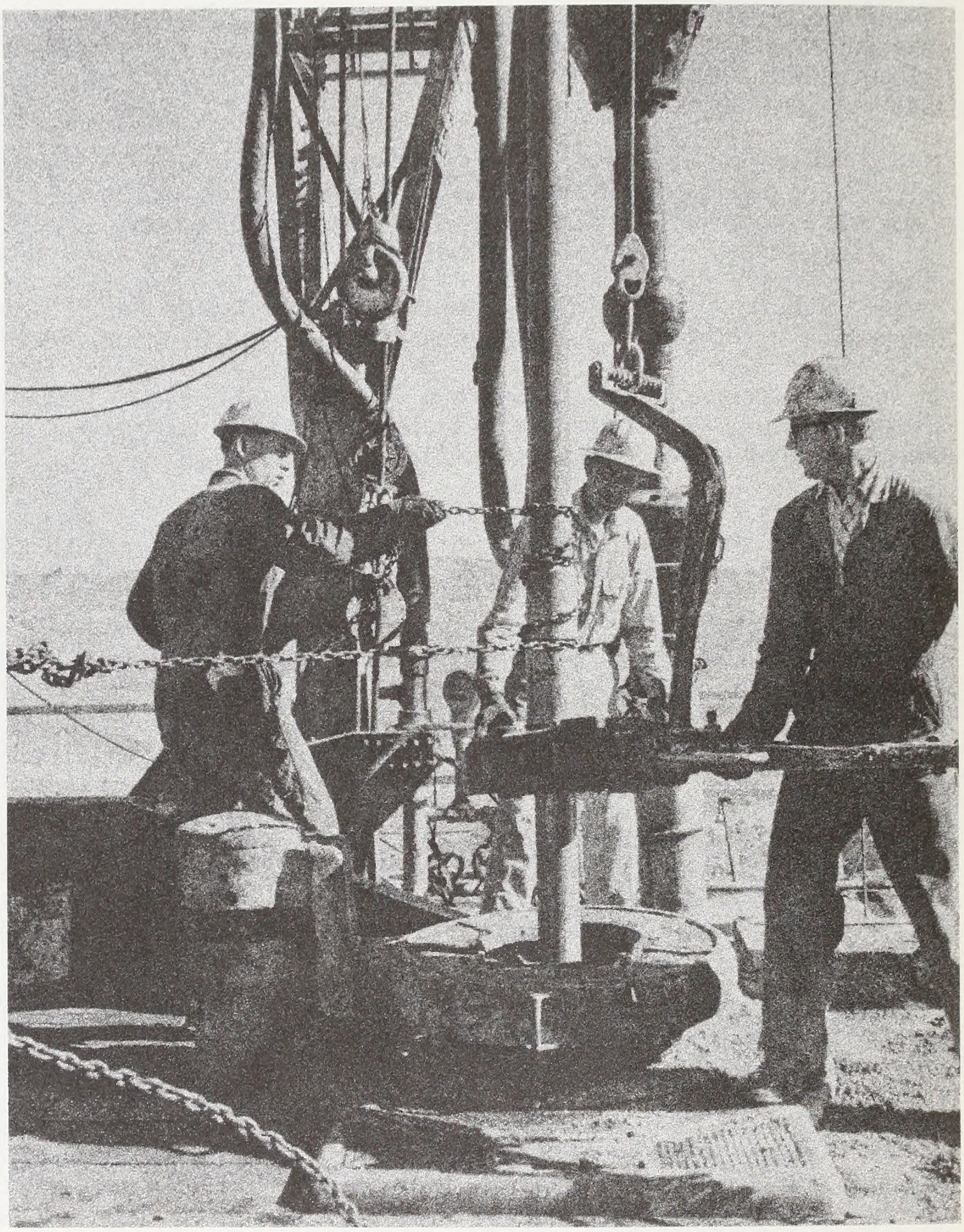
How will GS and BLM explain to the oil and gas operators the measures that must be taken to condition a particular field for abandonment? This question has made BLM realize that some procedure to accomplish this should be developed. Such procedures must identify the reclamation needs and the corrective actions to be taken. Oil fields are required to be reclaimed before final abandonment is approved by the Department of the Interior.

Reclamation of a producing field should begin after a well site is equipped for production. Disturbed areas, along access roads and around production facilities, no longer needed for operations should be recontoured and revegetated to prevent erosion.

BLM District staffs have developed a land management planning system that must be used by oil and gas operators whenever they are proposing expansion of new developing fields or planning rehabilitation of old existing fields. The information contained in this system can help identify conflict areas while helping operators develop reasonable measures to lessen the impacts of oil and gas construction activities within the field.

The GS, oil and gas operator, and BLM can establish a priority schedule for fieldwork. This will help the operator meet his present responsibilities for rehabilitation and eventually condition the field for abandonment once it is no longer producing. This document describes the processes that should be used to develop rehabilitation planning for any field in Wyoming.

The Department's authorities for requiring rehabilitation is the Mineral Leasing Act of 1920 (41 Stat. 437), as amended, the Mineral Leasing Act of 1947 for Acquired Lands (61 Stat. 913), stipulations in the lease, and stipulations for lease development specified by GS.



THE NEED FOR A REHABILITATION PLANNING STUDY

The present Wyoming GS and BLM compliance procedures do not provide the attention necessary to adequately monitor the growing amount of activities associated with oil and gas field development. A resource inventory method is needed to be developed that can be applied to all producing or developing areas. Most of the data base is documented in the BLM planning inventories. This inventory is part of the BLM planning system.

The inventory consists of a base map and numerous overlays for each resource present in the District. (For example, wildlife, vegetation, soils, etc.) The base map for the inventory is 1:126,720 scale. For the purposes of oil field rehabilitation planning, a base map of a 1:24,000 scale is suggested. This scale, along with comparable aerial photographs, gives appropriate detail for accurate inventory, analysis, and planning.

The rehabilitation plan is developed from the inventory information and field documentation of unrehabilitated areas. Once the plan is complete, the compliance staffs can more easily monitor field development activities on public land.

THE TIP TOP REHABILITATION STUDY AREA

The Tip Top oil and gas field was selected as a prototypical study model for developing the planning process and was used to document procedures as they were developed.

The Tip Top oil and gas unit is in an area where rehabilitation planning is critical. The field has been in existence for over 30 years; however, exploration is still quite active.

Tip Top is a 33,000-acre unit located in the Green River valley of western Wyoming and is traversed north to south by State Highway 235 (see Map 1). The following is a brief physical description of the area.

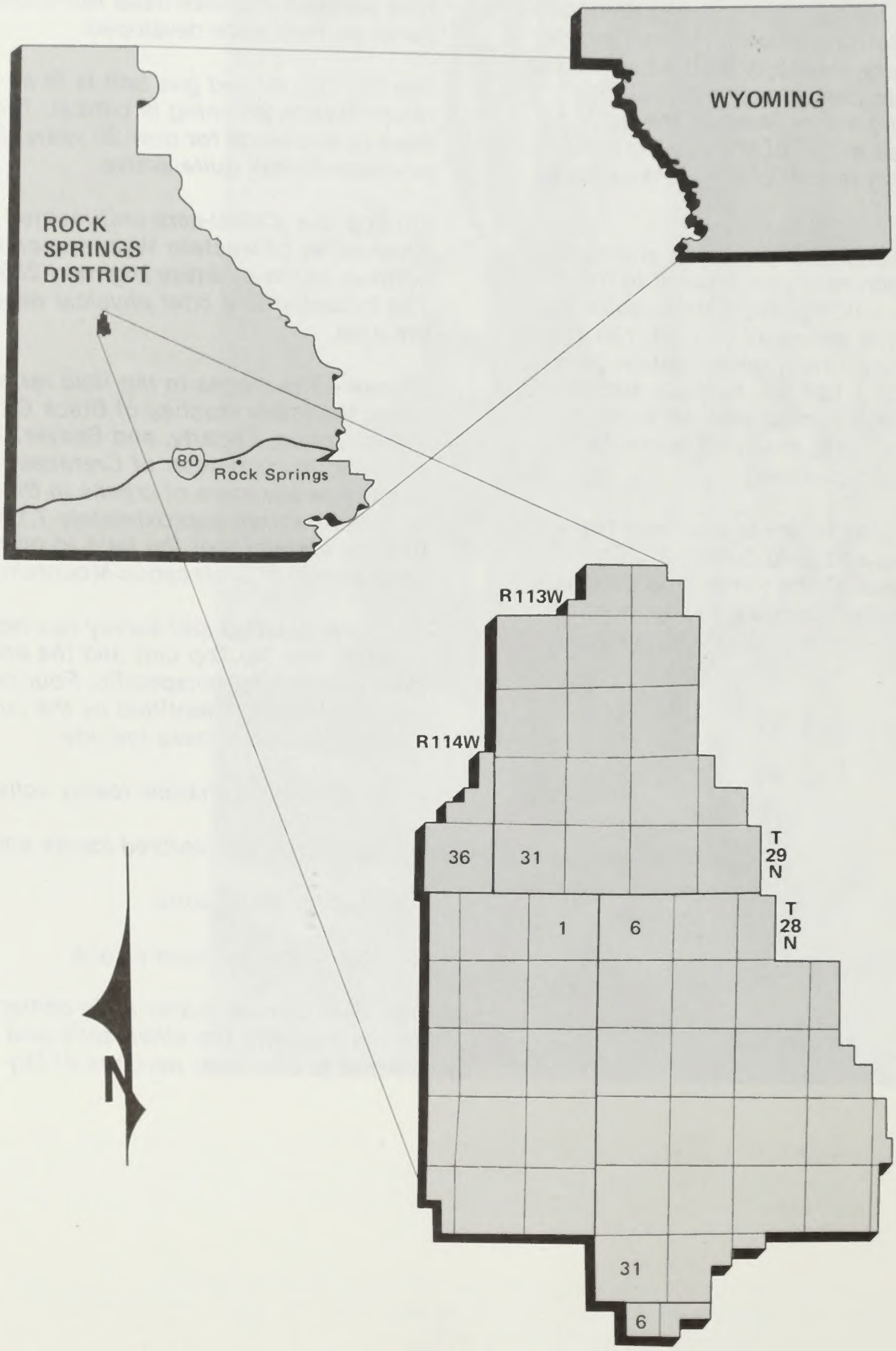
***Slopes**—The slopes in the field range from flat along the lower reaches of Black Canyon, Dry Piney, Spring, Fogarty, and Beaver Creeks to steep on the perimeter of Cretaceous Mountain and the headwaters of creeks in the area. Elevations range from approximately 7,100 feet on the eastern extremity of the field to over 8,600 feet at the summit of Cretaceous Mountain.*

***Soils**—A detailed soil survey has not been compiled for the Tip Top unit and the soils information available is nonspecific. Four basic soil types have been identified by the current unit resource analysis. These include:*

- *Dark colored shallow loamy soils*
- *Light and dark colored loamy soils*
- *Shallow alkali soils*
- *Poorly drained loamy soils*

The dark colored loamy soils comprise a majority of the unit with the alkali soils and badlands limited to the lower portions of Dry Piney Creek.

Map 1
GENERAL LOCATION



Vegetation*—The primary vegetation types in the Tip Top unit include sagebrush and grass with occasional riparian vegetation along streams and lakes. In addition, some aspen with mixed pine and fir groves appear along the western half of the field around Cretaceous Mountain.*

Water Resources*—Numerous intermittent streams traverse the area, flowing primarily from west to east. In addition, there are four primary perennial streams — Black Canyon, Dry Piney, Fogarty, and Beaver Creeks.*

Wildlife*—The most sensitive areas in the unit are the Colorado cutthroat trout habitats located in the upper areas of the perennial streams and the sage grouse strutting grounds located along Beaver Creek. In addition, the entire unit serves as a winter feeding ground for antelope and deer.*

The south face of Cretaceous Mountain has a unique sandstone formation that is now vertical because of geological shift. From the top of Cretaceous Mountain, one may see many miles into the Wyoming Mountain range to the west and Wind River range to the northeast. Because of the lack of forested areas on the site, surface disturbances are visible for several miles in some cases.

MAJOR SURFACE DISTURBANCES

Major surface disturbances resulting from oil and gas exploration and development include:

- — Locations (well site)
- — Roads
- — Pipelines
- — Tank Batteries
- — Powerlines
- — Pits

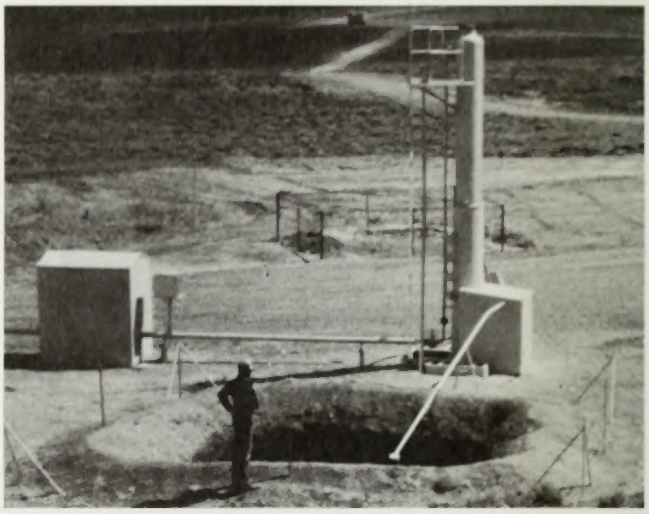
LOCATIONS

The location serves many purposes during exploration and production. During drilling, it serves as the pad for the drilling equipment. If the well is a producer, the locations can contain pump jacks, well head equipment, tank batteries, and pits. Locations usually vary in size from 2 to 6 acres. Most are flat, the only elevation variance being from the drilling platform to the reserve pit. However, the locations should not be level. A slight slope helps drain surface water and keeps the location from becoming muddy.

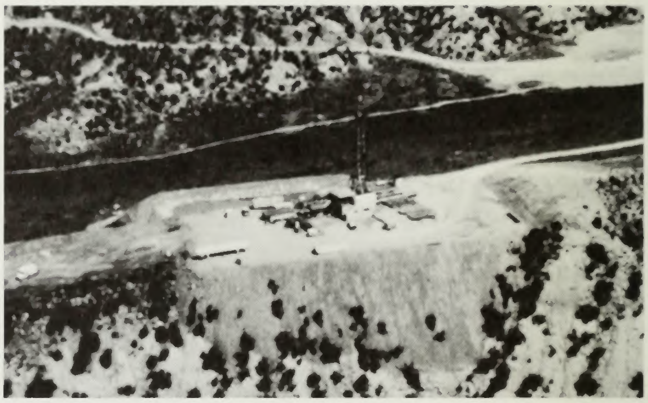
The greatest impact from a location stems from the fact that the pad must be almost level. Pad construction is a large earthwork operation in most areas of Wyoming. In steep terrain, this causes a significant amount of surface disturbance.

During construction, there is also a potential for topsoil loss if the operator does not stockpile as specified. The eventual need to restore the slope to original grade during rehabilitation operations is even more critical on steeper locations. During construction, it is important to place the excess cut material in an area where it can be retrieved for replacement. This may require that an actual stockpile area be designated, or the excess cut material be contained at one edge of the location. The removal of vegetation increases erosion potential from water and wind. On a site of 2 to 6 acres, the site-specific situation must be considered during planning operations.

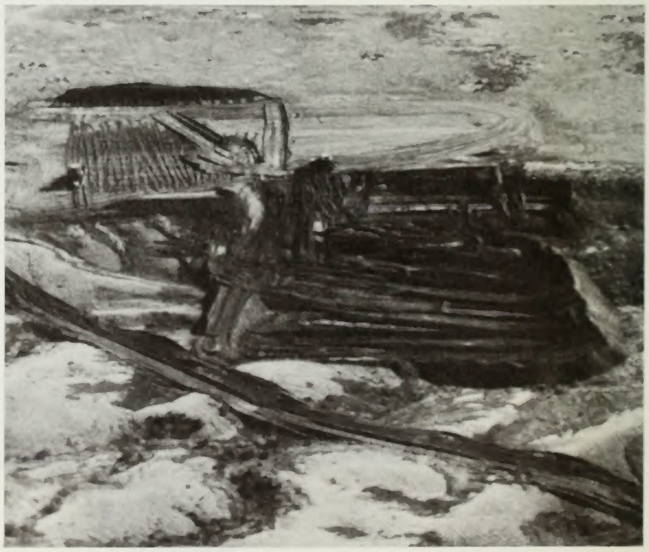
If a discovery is made, production facilities are placed on the pad. These facilities can include heater treaters, well head equipment, pump jack, etc. Once a well becomes a producer, it will be some time before the site can be completely rehabilitated. After the drilling is complete and the production equipment installed, some rehabilitation can begin outside the area needed for production.



A gas well in an oil and gas field should be adequately constructed to enhance future reclamation efforts.



Present demands for oil and gas products have necessitated the construction of drilling pads in areas with steep terrain.



Without proper supervision, the construction of a drilling pad could take up more space than needed or create unnecessary environmental problems.

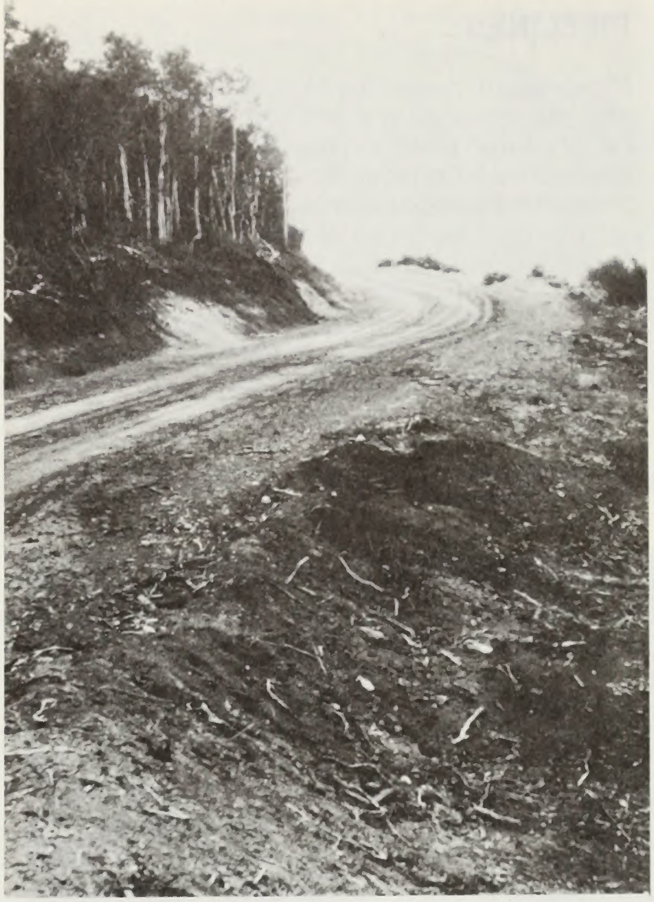
ROADS

Roads pose special problems because they are usually present for long periods of time. Rehabilitation, in most cases, will not be completed for several years. Single operators are responsible for each location, but many operators use the access road. It is difficult to assign responsibility for the maintenance and ultimate rehabilitation. Therefore, proper siting and construction are vital when maintenance and eventual rehabilitation are considered. Operators should utilize the resource maps prepared by BLM (to be described later) as guidelines for road planning, construction, maintenance, and rehabilitation.

Roads serve many purposes during drilling activities. Safety demands that access roads be properly constructed and maintained. Expenses of drilling a well necessitate minimizing down time. If a road is inaccessible, necessary materials, work crews, and emergency equipment cannot get on or off the site.

Once drilling is complete and the well becomes a producer, the roads provide access for maintenance equipment and crews that operate the field. Trucking may be the only method of transporting the products from the field. Properly constructed and maintained roads become even more essential.

The construction of roads impacts the area in a variety of ways. When a road is constructed, the vegetation cover is removed, increasing the probability of soil erosion. When vegetation is removed, surface water tends to rapidly accumulate and flow with increased velocity, creating erosion. In addition to the removal of vegetation, the existing topsoil, which is usually thin and lacking in organic matter, is also threatened.



Roads in a forested region create a variety of impacts such as vegetation removal.

A well constructed road in the oil and gas unit will be graded to facilitate ease of maintenance and rehabilitation.

PIPELINES

Pipelines are necessary to collect and transport oil and gas produced in a field to a central gathering facility. From this point they are used to transport the product to refining facilities and/or distribution networks. Pipelines may also be used for other production purposes such as water transportation in fluid injection, disposal of produced water, etc. Pipeline construction destroys vegetation and disturbs the topsoil the same as road and location construction. The degree of impact may not always be as great, depending on the size of pipeline being installed.

Pipelines occasionally break, creating localized spills. Improper backfilling, resulting in unnecessary mounds of settlement depression along the line, creates high potential for erosion and makes revegetation difficult. Since the lines are usually straight, their visual impact is significant, especially in rugged terrain.

TANK BATTERIES

Tank batteries are used to collect and store crude oil and other hydrocarbons produced in the field. They can also be used to separate oil and water if large amounts of water are produced with the oil. Heater treaters used to separate the oil and water mix are common near a tank battery. The tanks and treaters must be placed on a level area with good drainage. For safety purposes, the tanks and treaters must be placed certain distances from each other. Spill prevention dikes are constructed around most batteries to prevent spilled material from leaving the site. If the products are trucked from the field, the battery serves as a load out. It can be a large site depending on the number of treaters, tanks, access roads, or other equipment present.

Fire is a major concern at a battery. Therefore, vegetation is usually kept out of certain areas on the site. Ground disturbed during construction of the battery site, and far enough removed not to be a fire hazard, should be rehabilitated.

During production, many of the improvements at a battery are visually obtrusive since their color, form, and texture do not always successfully blend with the surroundings. Final rehabilitation of the site will not occur until the improvements are removed. This can be many years.

POWERLINES

In most cases, powerlines do not greatly alter the natural environment. Vegetation below 3 feet is left relatively undisturbed. However, the right-of-way is usually cleared in forested areas. In the latter case, the impact is greater and can have a long term influence on the area.

Poorly constructed pipelines created difficult situations for proper rehabilitation compliance.

Tank batteries become visual obtrusions which are sometimes seen for miles.

While surface disturbance is minimal in the construction of powerlines, their presence is visible throughout the landscape.

PITS

Pits serve many purposes in oil and gas drilling and production. Reserve pits (mud pits) are constructed during drilling next to the location. They are excavated earthen-walled pits, and are designed to contain fluids and solids that flow from the well during drilling. Their size depends on the anticipated depth of the hold, type of mud system used, anticipated water flows from the hole, geology, etc.

The nature of the materials within a reserve pit creates a high potential for environmental impact if they are not properly contained. The solids placed in the pit are primarily hole cuttings and drilling mud. The mud is mostly bentonitic clay. A common drilling fluid additive is barium sulphate (barite). It is used to increase the density of the drilling fluid for control of formation pressures.[1]

A reserve pit, especially one at high altitude, can pose a rehabilitation problem for an extended period of time. It is not rehabilitated until it is dry. Percolation usually does not occur due to the presence of the bentonite. After drying, the mud and cuttings are buried in the pit and the site is rehabilitated.

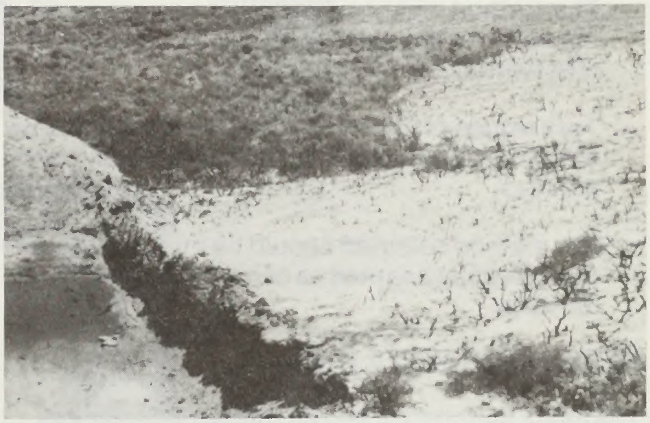
In a producing field, large amounts of produced water can be encountered. If this occurs, water storage pits are constructed downslope from the tank batteries. The water can be discharged on the surface if proper permits are obtained, or it may have to be stored for reinjection or evaporation. Considerable surface area can be required for pits if large amounts of water are produced.

At gas wells, pits are usually required if water is produced with the gas. Large amounts of water are usually not encountered, but if a separator is installed, a pit is needed to store the water separated from the gas.

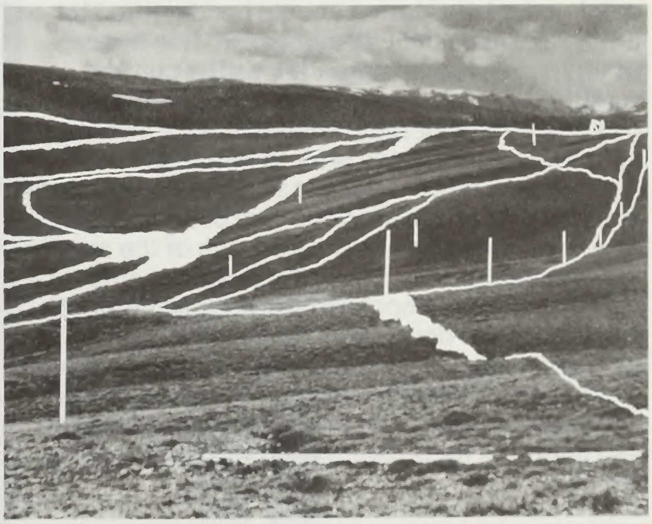
Sometimes reservoirs are constructed in a field as part of the operator's Spill Prevention Control and Countermeasure Plan ("SPCC PLAN"). They are placed within the field to prevent any spilled material from flowing out of the field. These require maintenance during field operations, and they may have to be obliterated upon field abandonment.

To illustrate the visual obtrusions and to a certain degree the environmental impact, a photograph has been highlighted that shows various locations, roads, pipelines, etc. With coordinated planning, disturbances can be studied, listed by priority, and scheduled for future rehabilitation based upon the severity of their impact on the environment.

A reserve pit should be properly constructed and sized to facilitate well fluids.



Improper construction of a reserve pit in the Tip Top Unit has resulted in overtopping, a situation where the drilling fluids exceeded the containment capacity of the pit. In this example, the fluid ran out over the dike and into the surrounding area.



This illustration was created to graphically emphasize the number of surface disturbances to be found on the Tip Top Oil and Gas Unit.

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[1] Perricone, Charles, 1980. Major Drilling Fluid Additives. 1980 Symposium: Research on Environmental Fate and Effects of Drilling Fluids and Cuttings. Library of Congress Catalog Number 80-69804. Pp. 43-50.

METHODOLOGY FOR REHABILITATION PLAN DEVELOPMENT

OBJECTIVES

This publication describes a methodology for planning the organization and rehabilitation of an oil and gas field. While developing the methodology, the following factors were considered:

- The method must be readily retrievable for use under a variety of circumstances such as establishment of rehabilitation and compliance priorities. Therefore, a graphic and map output was the preferable product.
- The method must be simple but accurate, utilizing only relevant data that is applicable to the rehabilitation of the field.
- Techniques of inventory and analysis should be structured so that all users could implement the process.
- The method selected should be in a format that can be easily adapted to computer storage and retrieval.

RESOURCE DATA POOL

The basic hypothesis for rehabilitation of oil and gas fields is that planning decisions can be made if surface disturbances can be directly related to environmentally and visually sensitive areas. In mapping significant environmental and visual features, only those features that affect development and rehabilitation should be identified for analysis. These include slopes, erosion susceptibility, revegetative potential, water, cultural, wildlife, and visual resources. Since each oil and gas operator is already responsible for inventory of potential cultural sites prior to initial surface disturbance, it is not necessary to include cultural aspects within this process. One overlay is developed by combining a variety of each of the remaining features. This is called the Environmental/Visual Sensitivity Composite Overlay (see Figure 1). The process of developing the Environmental/Visual Sensitivity Composite is the first phase (Phase I) of the total rehabilitation plan process; the second phase (Phase II) is the process used to establish priorities for rehabilitation within the producing field.

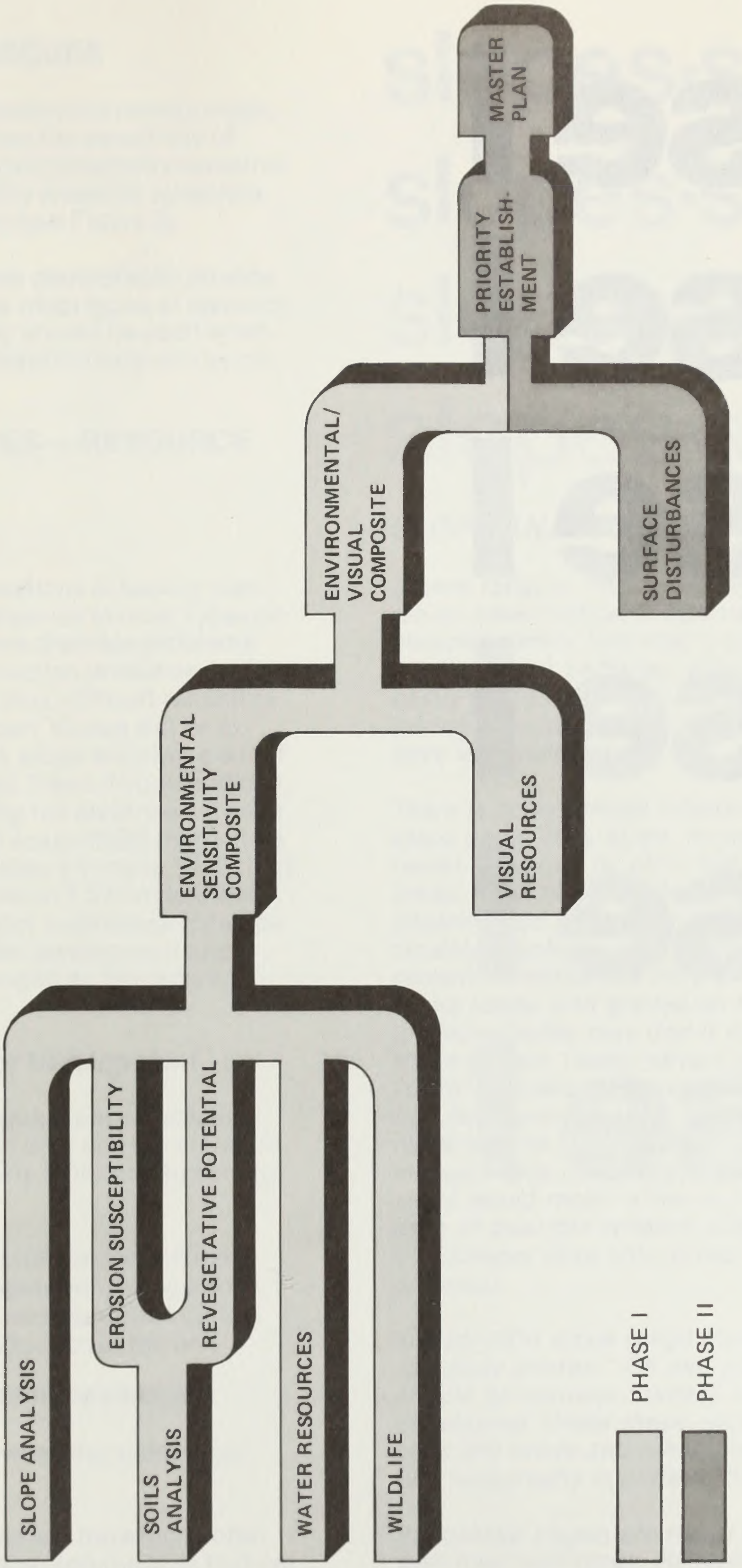


Figure 1
OVERLAY PROCESS

phase I
phase I
phase I
phase I
phase I
phase I

PHASE I

DELINEATION TECHNIQUES

On each of the following resource inventory maps, a graphic gradation indicates the sensitivity of each resource. The most environmentally sensitive areas and the highest priority areas for rehabilitation are the darkest in color (see Figure 2).

Recent advances in low level photography provide a good information base for most types of resource inventory. This photography should be used whenever possible to increase the efficiency and accuracy of data gathering.

MAPPING TECHNIQUES— RESOURCE INVENTORY

SLOPE ANALYSIS

Slopes are crucial considerations in facility planning. Flat slopes lend themselves to most types of construction, but may create drainage problems. Steep slopes create construction problems, higher potential for erosion, and, thus, difficult rehabilitation procedures. In this report, slopes will be expressed as a percent. A 6% slope will have a 6-foot drop for each 100 lineal feet. Slope (in percent) can be determined by measuring the distance between contour lines on a 1:24,000 scale USGS map with a "tic" chart. Figure 3 illustrates a sample "tic" chart for a 40-foot contour interval on 7.5 minute USGS topographic maps. Computer techniques for slope mapping are currently under development and their use should be encouraged as the program develops.

Objectives—Mapping for Development

- Consider the types of equipment or vehicles which will be used in the area and the standard slopes which will properly facilitate that equipment's use.
- Consider the types of conditions which exist relative to soil types, vegetation, and geology that affect erosion and sedimentation during the exploration and production of the unit.

Objectives—Mapping for Rehabilitation

Slope analysis should provide information that would:

- Demonstrate what areas will have high potential for erosion on surface disturbances that are ready for rehabilitation.
- Provide information that will be used as a guideline to rehabilitation standards and specifications.

slopes·slopes
slopes·slopes
slopes·slopes
slopes·slopes

SLOPE ANALYSIS

Slopes ranging from 0-6% range include major roads, construction of habitable structures, and semipermanent facilities. Locations, compressor stations, tank batteries, pipelines, etc., could easily be constructed on these slopes without having a major impact. These slopes will also have low erodibility.

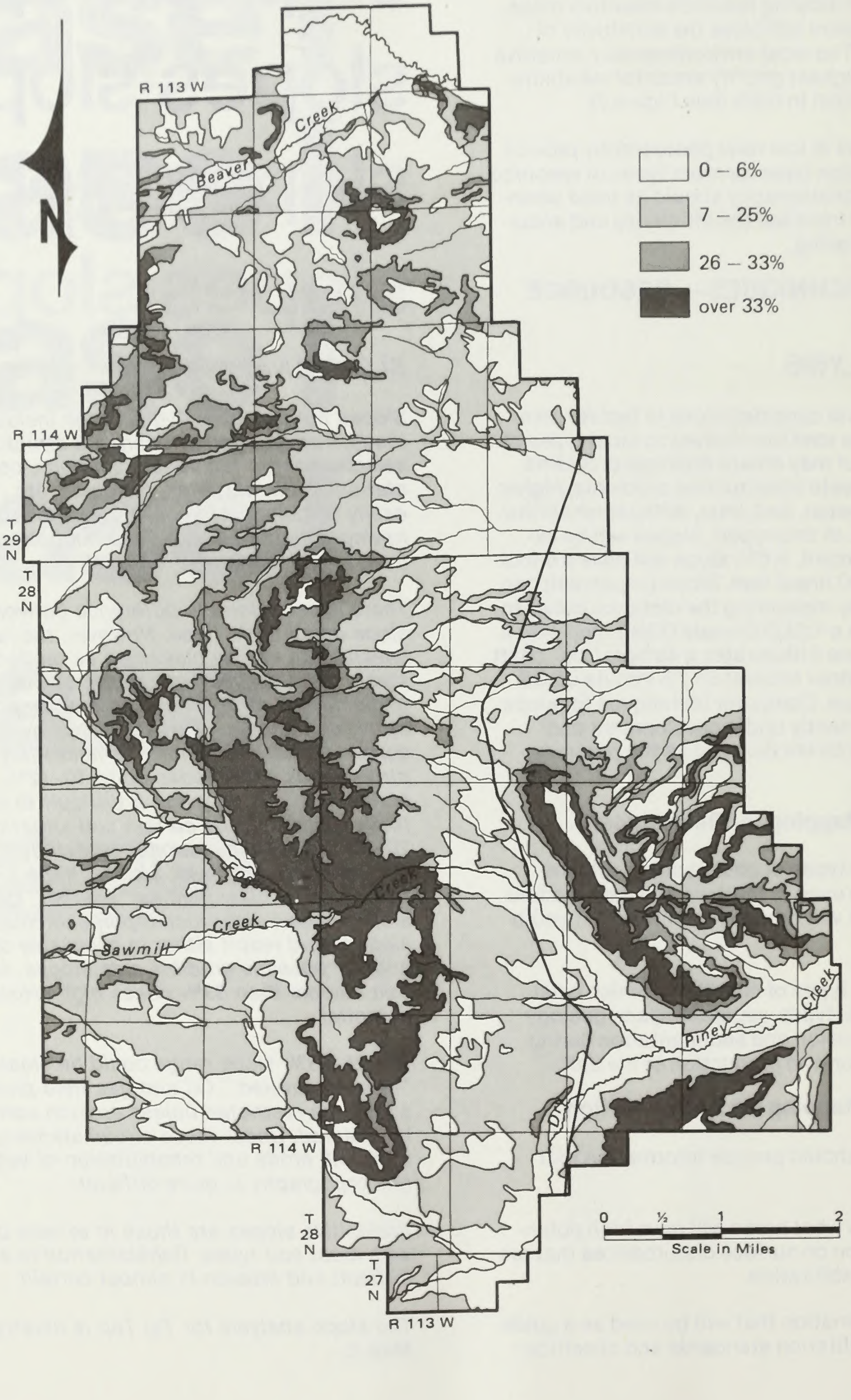
There is considerable difference between a 7% slope and a 25% slope. However, the range between them can be classified as moderately steep. Most oil field operations can be feasibly implemented on 7-25% slopes when proper construction techniques are used; however, there are certain limitations. It may be necessary to construct roads with grades up to 10-12%. Heavily loaded vehicles may find it difficult to negotiate these grades. Under certain soil situations, 20-25% slopes may erode, especially if vegetation has been removed. Slopes in the 7-25% range can be classified as "limited." On 25% slopes, roads constructed perpendicular to the slope would result either in excessive disturbance or possible erodible side slopes. Any situation steeper than 33% poses high erosion potential.

The 26-33% slope range could be classified as "severely limited." Oil and gas field production should be restricted unless erosion controls can be ensured. Under these circumstances, most soils will erode and rehabilitation of vegetation and topography is quite difficult.

Prohibitive slopes are those in excess of 33% with most soil types. Rehabilitation is extremely difficult and erosion is almost certain.

The slope analysis for Tip Top is illustrated on Map 2.

Map 2
SLOPE ANALYSIS



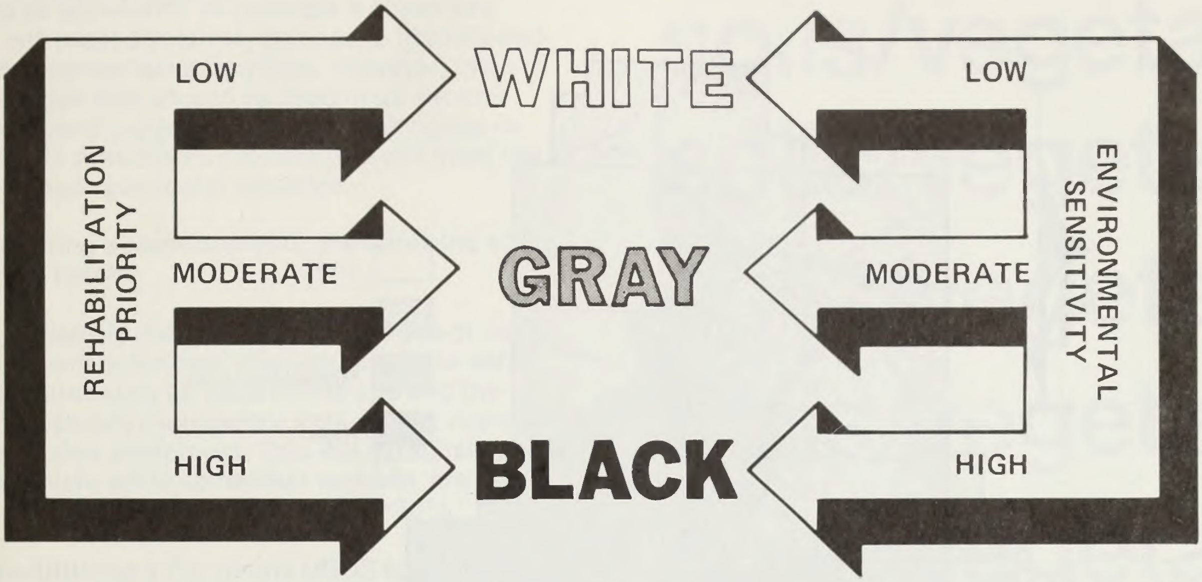


Figure 2
REHABILITATION SCALE

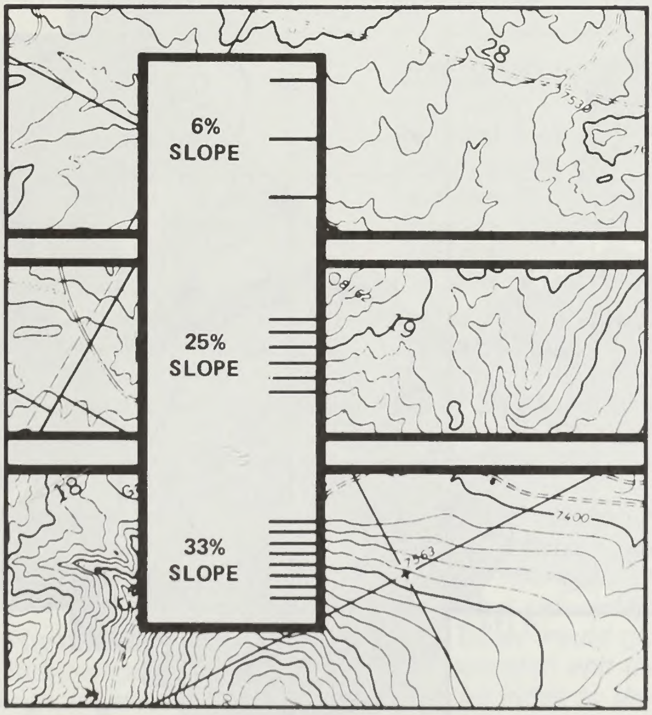
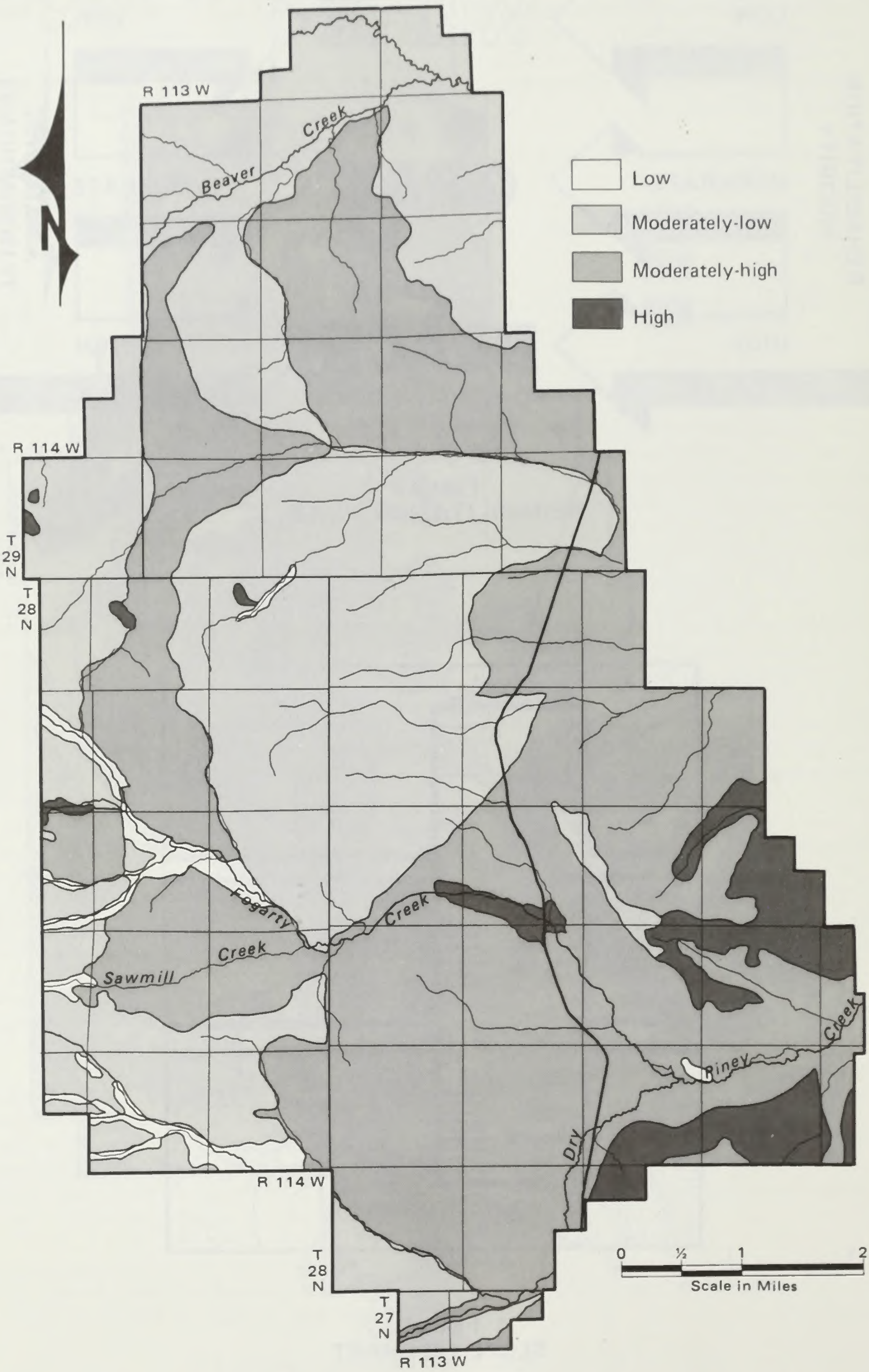


Figure 3
SLOPE TIC CHART

Map 3
VEGETATIVE ANALYSIS



Procedures

Outline as accurately as possible a procedure which will most effectively be used to identify and map the appropriate categories. However, there is no technique that should be used in all circumstances. Good judgment by those making the inventory will prescribe a process that will meet the needs of each particular situation.

In conducting a slope analysis, the following steps should be taken:

Step 1—Identify the type of projected use of each area. Use will determine what equipment or vehicles will ultimately be used on the site and the slope thresholds required for safe and efficient operation of that equipment. This will establish slope ranges which, while somewhat variable, are usually 0-6%, 7-25%, 26-33%, and over 33%.

Step 2—Utilizing a 7.5 minute USGS topographic map, estimate all slopes with the use of the "tic" chart provided that the contour interval equals 40 feet. If the contour interval is different or if the topographic map is 15 minute in scale, another tic chart must be developed.

Step 3—After the slope ranges and slope zones have been identified, render the steeper slopes with dark screen or marker and then lighten with each consecutive zone.

SOILS/VEGETATION ANALYSIS

Soils and other geotechnical resource information are crucial to the resource inventory. Soils and surficial geology constitute the medium in which construction, rehabilitation, and maintenance occur. Soils and surficial geology in consort with other site factors will determine if a site is suitable, moderately suitable, or unsuitable for specific uses. Soil and other site characteristics will describe the potentials and limitations of each site and therefore enable accurate site specific planning and engineering design for development, rehabilitation, and maintenance.

Objectives—Mapping for Development

Soil and surficial geology data should be used to accomplish the following:

- To understand soil suitability for planning, locating, and developing improvements such as roads, drilling pads, pipelines, reservoirs, borrow sites, waste disposal sites, etc.

- To identify areas where problems will be critical to safety and the environment. In such cases, more testing and additional engineering will be required.

soils/vegetation
soils/vegetation
soils/vegetation
soils/vegetation
soils/vegetation
soils/vegetation
soils/vegetation

SOILS/VEGETATION ANALYSIS

Relevant soils data for Tip Top are not available to the degree of detail needed to measure erosion susceptibility or revegetative potential. Because of the size of Tip Top (33,000 acres), it was impractical to conduct a field survey within the time frame allotted for the study. In lieu of such data, the study had to be conducted with the use of vegetative site data for range allotment which was collected by observation in 1962. While the data could hardly be considered as current, it was the only data available. In addition, it was reliable and detailed enough to be of value.

In order to manipulate the data into a meaningful form, two categories of information were extracted. This consisted of percent of vegetative cover and percent grasses. Using the percent of total cover would give an indication of revegetative potential and the percent of grasses would offer an index to the establishment of grasses for slope stabilization. This is especially valuable since grasses have fibrous root systems which hold soil.

Objectives—Mapping for Rehabilitation

Data should be used to accomplish the following:
- To classify soil mapping units by their erosion susceptibility and revegetation potential.

- To prescribe specific construction and revegetation practices for each soil mapping unit.

Data Sources—Geologic Hazard Survey

- Erosion and sedimentation susceptibility
- Potential aquifer recharge
- Potential borrow areas
- Potential slope instability
- Other hazards as may be apparent

Data Sources—Agronomic Soil Survey

The best available soil inventory is a completed Level II soil survey. It contains necessary data needed to accomplish the objectives. The Soil Conservation Service (SCS) may not have a published county soil survey but may have a completed but unpublished survey or a partial survey which may include the oil and gas unit in question. Upon request, the SCS will usually make such information available. Any Level II survey should still be randomly checked in the field by a qualified soils specialist to ensure the accuracy of soil boundaries.

A secondary source is a Level III soil survey. The Wyoming BLM is presently conducting soil surveys as a part of the Soil-Vegetation Inventory Method (SVIM) program. Ultimately, all Wyoming BLM lands will be surveyed and mapped. A followup field directed survey should be conducted to verify the soil association and soil complex boundaries. If used, the soil association should be subdivided by soil series for more finite soil descriptions.

Another equally good source is a field directed survey conducted by a qualified District soil specialist or by contract to soil consultants. Should the survey be contracted, it would still be necessary to oversee and randomly check the work by the consultants. In a field directed survey, data gathering should be limited to specific soil factors affecting the objectives of the soil inventory.

Sensitivity categories are as follows:

- *Low vegetative potential—severe sensitivity*

- *Moderately low vegetative potential—moderately severe sensitivity*

- *Moderately high vegetative potential—moderately low sensitivity*

- *High vegetative potential—low sensitivity*

While the method described was sufficient in drawing conclusions relative to rehabilitation, it is not the preferred process. The process as described under Soils Analysis *on the left is the recommended manner is developing a rehabilitation plan. It is further advised that the planning of a producing unit be coordinated with soil studies as they are being conducted throughout the State.*

The vegetative analysis that was used on Tip Top is illustrated on Map 3.

Data Sources—Engineering Soil Survey

In addition to the agronomic soil survey, an engineering soil survey should be conducted concurrently. It is essential that the following data, particularly with regard to the "C" horizon and substrate or regolith material be accurately determined:

- Unified classification
- Gradation analysis
- Atterburg limits
- Depth to bedrock
- Depth to seasonal high water table
- Any additional data that is essential for planning, future construction, engineering, rehabilitating, or maintaining a particular site for a particular use. This primarily pertains to those sites which have been determined as areas requiring additional testing and engineering development.

Procedures

Step 1—Conduct a Geologic Hazard Analysis using recent aerial photography and most recent and accurate surficial geologic data.

The following areas are to be identified:

- Areas of high erosion (using drainage density analysis).

- Areas of potential instability.

- Areas with soils of fine particulate where erosion will create severe sedimentation problems and potential stream pollution.

- Areas presumed to provide good borrow sites if they appear to be few in number and, therefore, a valuable resource.

- Areas of potential aquifer recharge.

The above areas are mapped and labeled on the soils inventory sheet.

Step 2—All existing soils information pertaining to the oil and gas field should be reviewed. If a Level II soil survey exists, then this information will be field checked and used for identifying and interpreting soils data. If a Level III soil survey exists, then this information will be used as a basis for a Level II survey to be conducted by the soils specialists. The Level II boundaries will then be field checked in conjunction with engineering soils testing. If neither a Level II nor a Level III soils survey exists, then a field directed soil survey must be conducted. The soil specialist will locate the boundaries of the various soils series, then identify and field check the soils in conjunction with engineering soils testing. All soils data will be noted on the *Mapping Unit Log—Soil Characteristics* (see Figures 4, 5, and 6). Also, pertinent site data will be noted on the Unit Log. It is recommended that a geotechnical engineer work in concert with the soil specialist.

Step 3—Personnel knowledgeable in engineering, soils, geology, and compliance will meet to determine the following:

- Where further soil and geologic testing needs to occur prior to any significant development.

- Assessment of erosion rating and promulgating factors leading to potential erosion for each soil mapping unit. Erosion rating will range from lease sensitive (1), to moderately sensitive (2), and to most sensitive (3).

Step 4—Soil specialists, in consultation with range, wildlife, and compliance personnel, will determine revegetative ratings and limitations. Reference is also made to the revised oil and gas manual for specific methods and materials to be used in seedbed preparation, seeding rates, weed control, mulching, fertilization, and surface protection mechanisms. As in the recommended engineering practices, revegetation practices will also be based upon soil and site types. Also, if special revegetation needs exist on a particular site, appropriate recommendations should be made at this point.

MAPPING UNIT LOG
SOIL CHARACTERISTICS

OIL & GAS UNIT: ____________
SOILS SPECIALISTS: ____________

PAGE: ________
DATE: ________

SOIL MAPPING UNIT	DEPTH TO		DEPTH FROM SURFACE	CLASSIFICATION		REACTION(PH)	COLOR	AVAILABLE WATER HOLDING CAPACITY	SODIUM ABSORBTION RATIO	PERMEABILITY	COARSE FRACTION GREATER THAN 3"	PERCENTAGE LESS THAN 3" PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	OTHER
	BEDROCK	SEASONAL HIGH WATERTABLE		USDA TEXTURE	UNIFIED							NO. 4 (4.7 MM)	NO. 10 (2.0 MM)	NO. 40 (.42 MM)	NO. 200 (.074 MM)			

The soil and site data found on the Mapping Unit Log is defined as the minimum data necessary to rate the erosion susceptibility and revegetation potential of each soil mapping unit, to interpret use suitabilities, and to recommend specific construction and revegetation materials and practices.

Since this process must be applied statewide, it must be flexible enough to be used for a wide range of site situations, numerable combinations or permutations of various site and soil characteristics. For instance, slope ranges and the effect of slope will depend upon such factors as precipitation and soil type. Therefore, it is emphasized that decisions concerning methods and criteria for measuring and surveying site and soil characteristics be at district levels. For the same reasons, the interpretations for planning and implementation must also be at the district level.

Figure 4
MAPPING UNIT LOG - SOIL CHARACTERISTICS

MAPPING UNIT LOG
SITE CHARACTERISTICS

AVERAGE ANNUAL PRECIPITATION: __________
PREDOMINANT WIND DIRECTION: __________

PAGE: ______
DATE: ______

SOIL MAPPING UNIT	SITE CHARACTERISTICS					GEOLOGIC HAZARD ANALYSIS						EROSION FACTOR		REVEGETATION FACTOR	
	ASPECT	SLOPE RANGE	% COVER	% GRASSES	OTHER	EROSION SUSCEPTIBILITY	POTENTIAL SLOPE INSTABILITY	SEDIMENTATION SUSCEPTIBILITY	POTENTIAL AQUIFER RECHARGE	POTENTIAL BORROW	OTHER	RATING	LIMITING FACTORS	RATING	LIMITING FACTORS

Figure 5
MAPPING UNIT LOG - SITE CHARACTERISTICS

MAPPING UNIT LOG
SOIL/SITE SUITABILITIES

OIL & GAS UNIT: ______

PAGE: ______
UNIT: ______

SOIL MAPPING UNIT	LOCATIONS				ROADS				PIPELINES			
	FACTOR	ENGINEERING LIMITATIONS	REVEGETATION LIMITATIONS	REFERENCE	FACTOR	ENGINEERING LIMITATIONS	REVEGETATION LIMITATIONS	REFERENCE	FACTOR	ENGINEERING LIMITATIONS	REVEGETATION LIMITATIONS	REFERENCE

Figure 6
MAPPING UNIT LOG - SOIL/SITE SUITABILITIES

Step 5—The soils map for the oil and gas field will be finalized.

The following table will be ascribed to each soil mapping unit:

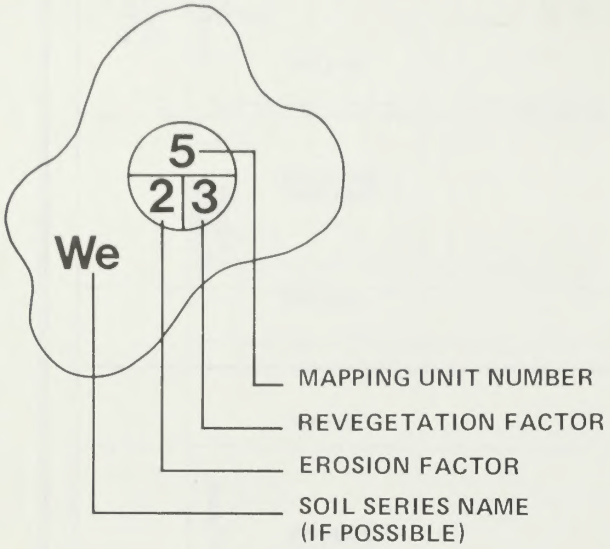
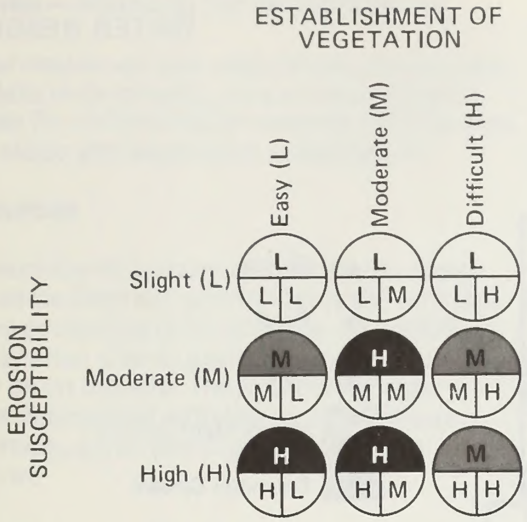


Figure 7
SOIL UNIT SYMBOL

In a legend on the soil map, the map symbol for the soil is given with further descriptions. (For example, a We soil would be labeled as We-Wakeen Silt Loam, 1 to 3 percent slopes, eroded.) If a soil series name can be given to the soil mapping unit, this should be done prior to interpretive meetings. SCS soil descriptions and interpretations should be made available to those attending.

Step 6—An overall soil sensitivity plat will then be completed. Critical to the development of the soil sensitivity plat is an understanding of the interrelationships of soil erosion and revegetation. In Wyoming, as in other arid areas, situations exist where vegetation cover and soil erosion are not inextricably linked. For instance, a rocky soil may have sparse vegetation and yet erosion remains limited. Its correlary, a loose fine soil, may have extensive revegetation, but the erosion potential may remain high. There are also areas where erosion is a natural feature, such as in the badlands. In these areas, there may be little cause for expending large sums of money to revegetate when eventually the area will return to its natural state of sparse vegetation. The following matrix is used to better define soil sensitivity in terms of erosion susceptibility and revegetation potential:



NOTE: Establishment of vegetation is defined as the natural or inherent potential for a site to establish vegetative cover. Use SCS range site data as a source.

Each of these symbols is associated with a soil mapping unit and, therefore, needs only to be translated as having a low (L-white), moderate (M-gray), or high (H-black) soil sensitivity.

Figure 8
RECLAMATION PRIORITY MATRIX

Step 7—Identify any threatened and endangered plant species or communities that should be protected. These areas should be identified and placed on a soils/vegetation map.

WATER RESOURCES ANALYSIS

Water resources are important to this study for several reasons. Streams are impacted by pollution from both on- and offsite runoff. During oil and gas exploration activities, harmful fluids and gases could pollute surface water and ground water resources, and if such resources are located in aquifer recharge areas, subsequent pollution to the aquifer can result.

The construction of support facilities increases erosion. Eroded materials accumulate in or near streambeds. Large amounts of alluvium can affect valuable meadow and stream buffer habitats. Additional silt load is a threat to fisheries by creating change in the physical and chemical properties of the water and streambed.

Objectives—Mapping for Development

The water resources analysis should identify and delineate sensitive areas and discourage proposed harmful development in them.

water resources

water resources
water resources
water resources
water resources
water resources
water resources
water resources

WATER RESOURCES ANALYSIS

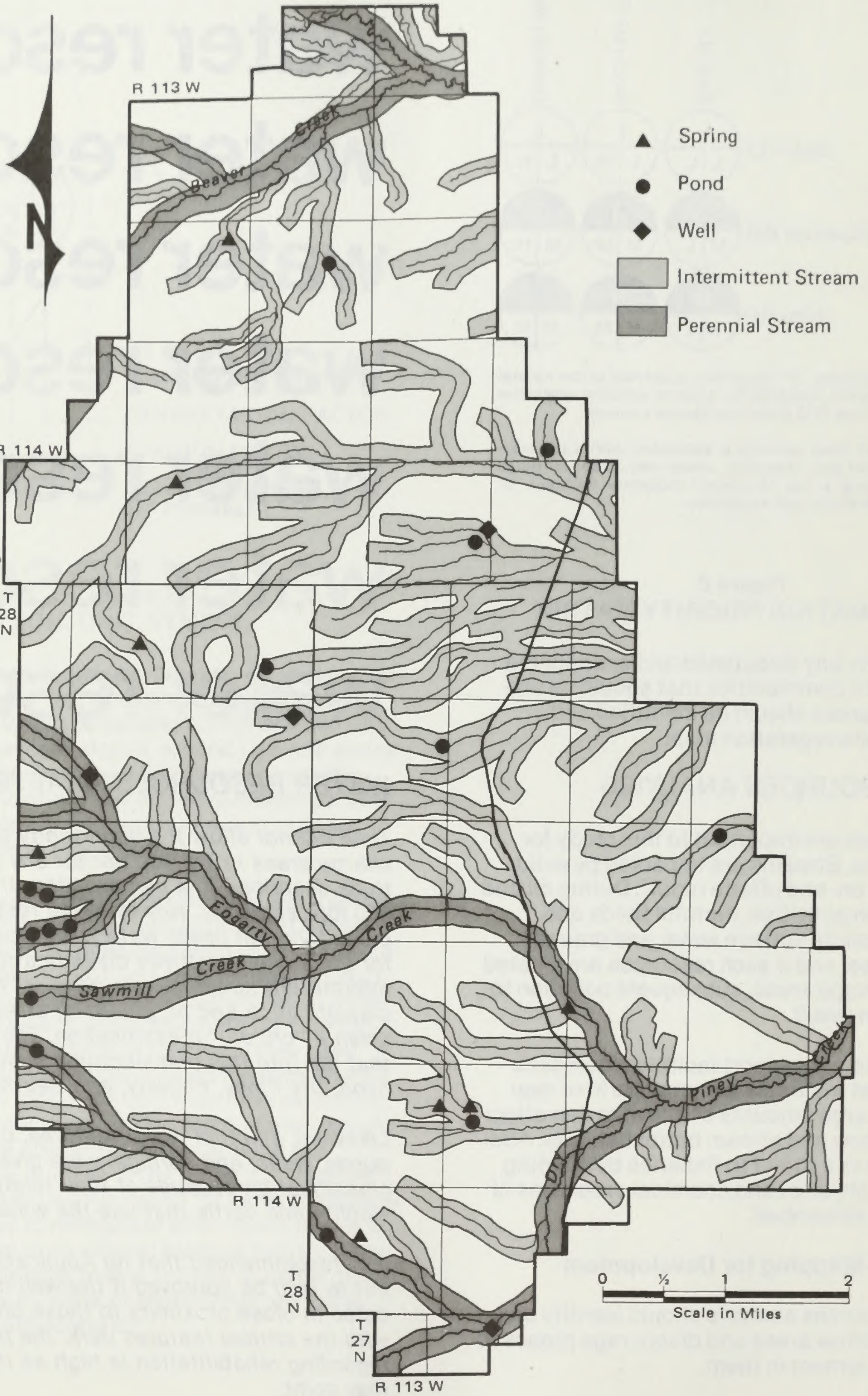
Time did not allow the opportunity to identify recharge areas in Tip Top nor for any linear feature to be described in a manner other than the use of 500-foot setbacks. However, the researchers concluded that all linear waterways would not qualify for the same sensitivity classification. Thus, all intermittent streams were given a "moderate" classification and all perennial streams were given a "critical" classification. The four streams that fall into this classification include Black Canyon, Dry Piney, Fogarty, and Beaver Creeks.

Likewise, all other water features, consisting of ponds, wells, and springs, were given "critical" classification because of their relationship to wildlife and cattle that use the water.

It is recommended that no Applications for Permit to Drill be approved if the well is to be located in close proximity to those critical features with the critical features dark, the priority status regarding rehabilitation is high as it should be at that point.

The water resources map for Tip Top is illustrated on Map 4.

Map 4
WATER RESOURCES



Objectives—Mapping for Rehabilitation

The water resources analysis should provide data that assists in developing proper rehabilitation guidelines for sedimentation control until the area reaches slope and vegetation stabilization.

Data Sources

Current surface disturbance stipulations developed by some Districts provide for a 500-foot setback from centerline of all streams. The 500-foot setback applies also to springs, ponds, and wells that may be on the site. The location of each feature is determined with USGS 1:24,000 topographic maps, aerial photography, and field verification.

Procedures

A setback should only apply to riparian habitats with the distance being relative to landform and not a standard 500 feet in all cases. Future planning should consider the physical characteristics (size, slope, soils) of the watersheds in determining the setbacks.

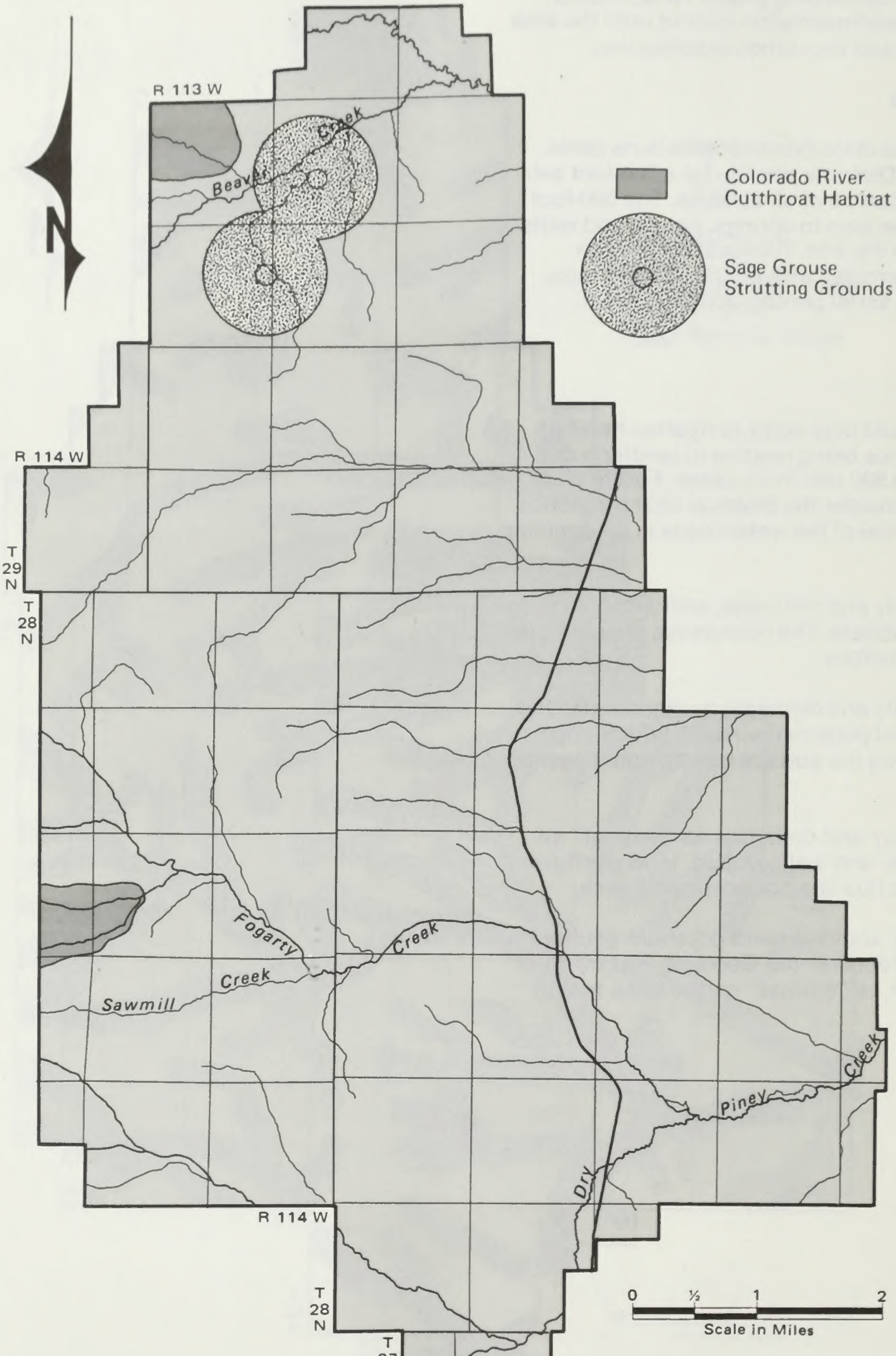
Step 1—Identify and delineate, with a dark tone, the riparian habitats. The boundaries should be determined by landform.

Step 2—Identify and delineate as "moderate" the intermittent and perennial streams without riparian habitat using the surface management agency setback.

Step 3—Identify and delineate as "critical" all springs, ponds, and wells. Again, land configuration should dictate the boundaries of each.

Step 4—Verify and/or amend potential aquifer recharge areas found in the Geologic Hazard Survey. Designate as "critical" on the base map.

Map 5
WILDLIFE



WILDLIFE ANALYSIS

Objectives—Mapping for Development

The major objective in mapping wildlife resources is to identify and regulate those zones within the unit where oil and gas exploration may seriously hamper the existence or welfare of wildlife within the area.

Objectives—Mapping for Rehabilitation

Surface disturbances directly affect vegetation cover which provides wildlife habitat. Rehabilitation efforts should be geared toward reestablishment of native vegetation losses. While vegetation has been mapped, critical wildlife areas call attention to those areas where wildlife and vegetation are simultaneously critical. In addition to land surface considerations, riparian systems with critical fish and wildlife species must be protected and/or rehabilitated as quickly as feasible.

Data Sources

The most valuable resource to be used in wildlife analysis would be the use of wildlife biologists who are familiar with the area. Initial District data can also be secured from the current wildlife data as supplied by Planning Unit Inventory.

Procedures

Step 1—Review Planning Unit Inventory data relative to wildlife areas.

wildlife·wildlife
wildlife·wildlife
wildlife·wildlife
wildlife·wildlife

WILDLIFE ANALYSIS

The primary data source regarding wildlife and wildlife habitats for Tip Top has been the State and Federal agency staff biologists. BLM resource area biologists are well equipped to identify sensitive situations.

In the case of the Tip Top oil and gas unit, wildlife habitat of primary concern fell into three major categories:

- *Deer and antelope winter range*
- *Colorado River cutthroat trout habitat*
- *Sage grouse strutting grounds*

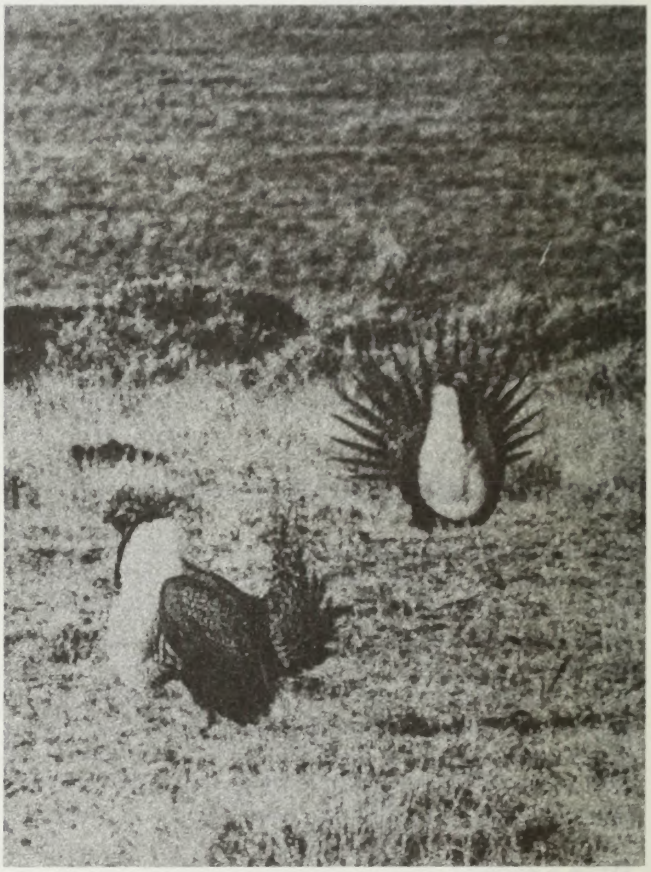
The entire Tip Top unit serves as a deer and antelope winter range and in the opinion of BLM wildlife biologists, the wildlife have not been affected by development. However, if surface disturbances become too excessive and the area not revegetated as development is completed, the use of the area as a wintering ground could drastically be altered. It is advised that continuing, long term wildlife studies be conducted which will ensure the success of wildlife populations in the Tip Top area.

Colorado River cutthroat trout have been identified in Spring and Fogarty Creeks. The entire watershed has been delineated as sensitive and should be protected as much as possible.

Step 2—Using the expertise of the various wildlife biologists, identify critical zones as follows:

- White—Situations where exploration and/or drilling will not likely have a negative impact on habitats of special concern.
- Gray—Situations where exploration and/or drilling may negatively affect wildlife species or habitats of special concern on a temporary basis. All riparian zones, big game critical winter ranges, migratory corridors, fawning grounds, sensitive species habitat, special wildlife management areas, and land within 2 miles of a sage grouse lek will fall into this category.
- Black—Situations where exploration and/or drilling may produce a permanent and irreversible negative impact upon a wildlife species or habitat of special concern. All threatened and endangered species habitat, areas within ¼ mile of a sage grouse lek, areas within golden eagle protective buffer zones or other areas critical to species of special concern will fall into this category.

Perhaps the most difficult wildlife habitat resource to deal with on Tip Top is the sage grouse strutting grounds. The exact nature of the potential impact that oil and gas field development has on these areas has not been resolved at this point. A 2-mile radius was used for a setback on those two areas for certain periods of their life cycle. However, its status as "critical" may be unjustified, especially in light of the seasonal nature of the strutting activities. Wildlife resources are shown on Map 5.



MAPPING TECHNIQUES—VISUAL RESOURCES

Objectives

The primary objective is to determine those areas where the public has visual access to disturbance which has a significant adverse impact on its visual quality.

Data Sources

In mapping visual resources, there are six basic data sources:

- *Physical Provinces of the United States*, by N. M. Fenneman (USGS).
- *Ecoregions of the United States*, by R. G. Bailey (or a State supplemental map of the physiographic regions within the State).
- Recent aerial photography.
- Field checking and inventory.
- USGS topographic survey maps.
- BLM Manual Section 8411—Upland Visual Resource Inventory and Evaluation.

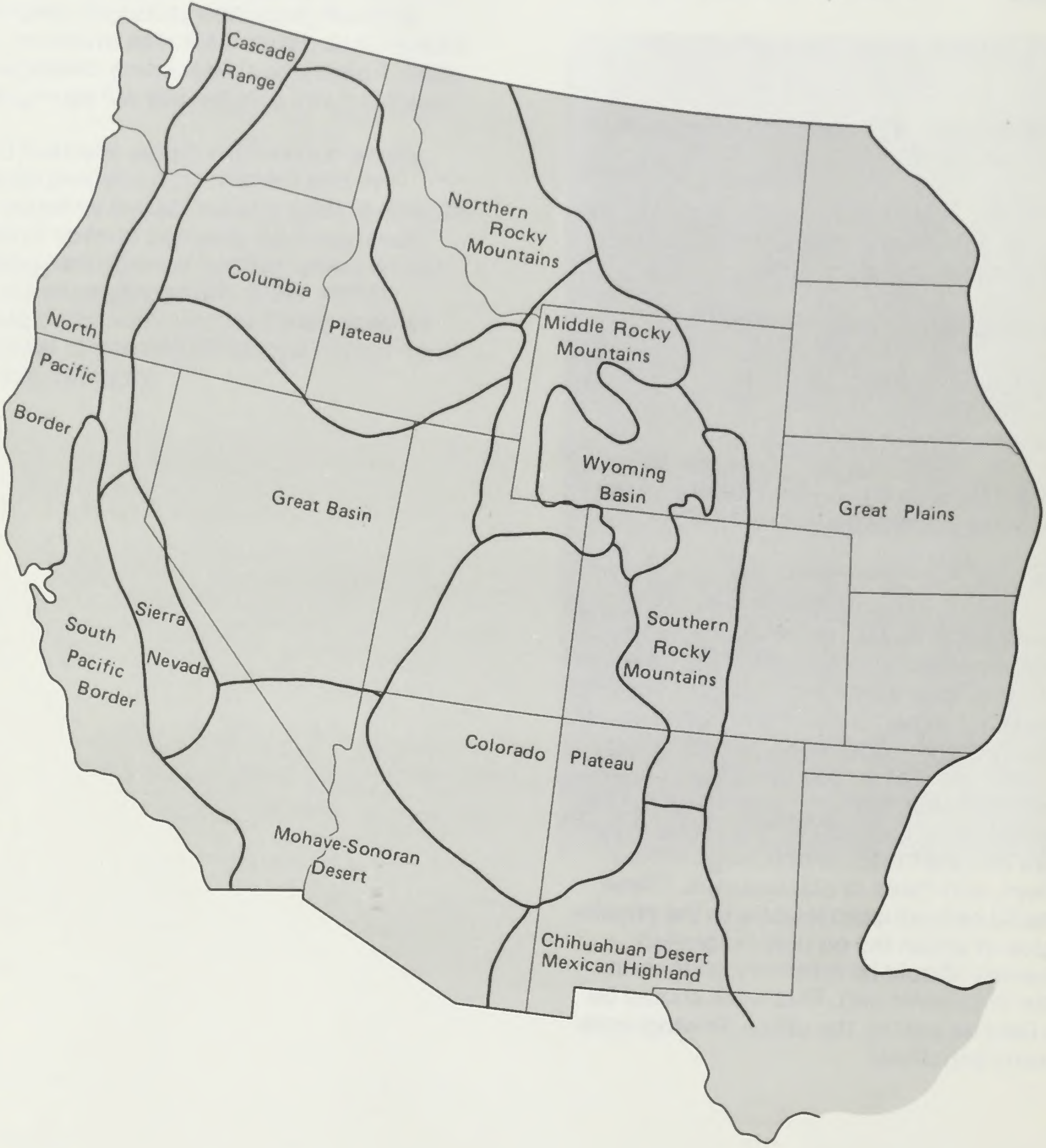
Procedures

Step 1—Preparation: The surveyor is to note the physiographic province in which the study area lies within the United States and Wyoming (see Maps 6 and 7). Using USGS topographic surveys and aerial photography, determine and briefly describe the physiography of the land surrounding the unit. In addition, the landscape features used to delineate Scenic Quality Rating Units (SQRU) must be determined. These include meadowland, large timber stands, valleys, and mesa or plateau tops. These features should be evaluated relative to the physiographic region in which the oil field is located. Also, the scenery should be relatively uniform in nature within the scenic unit. This work should be done in the field as well as the office. Photographs are particularly beneficial.

MAPPING TECHNIQUES—VISUAL RESOURCES

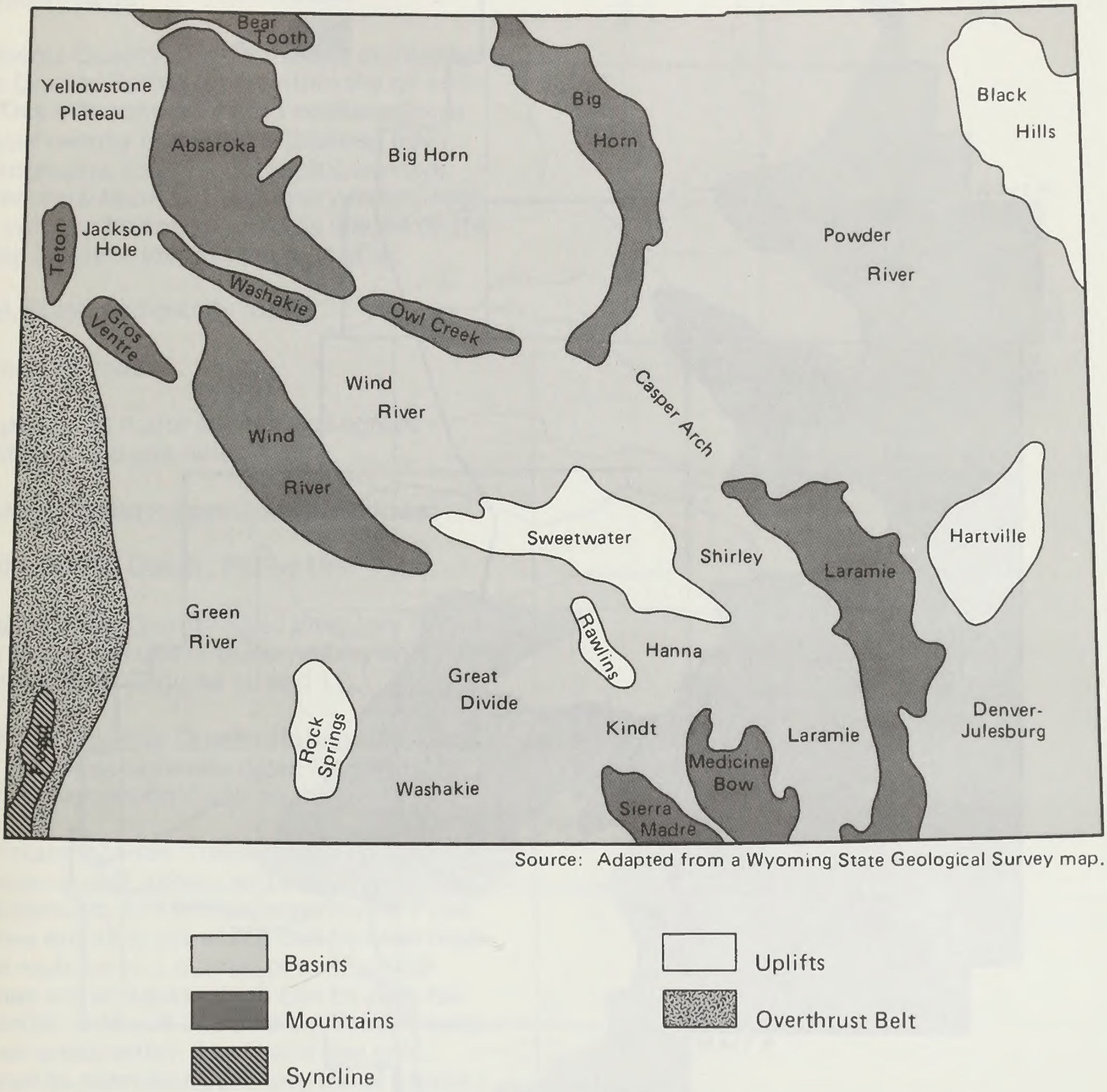
The procedures outlined on the left were followed. A visual resources map was prepared and used to develop the environmental/visual sensitivity zones that are described later in the text. The visual resources for Tip Top are illustrated on Map 8.

Map 6
PHYSIOGRAPHIC PROVINCES —WESTERN UNITED STATES



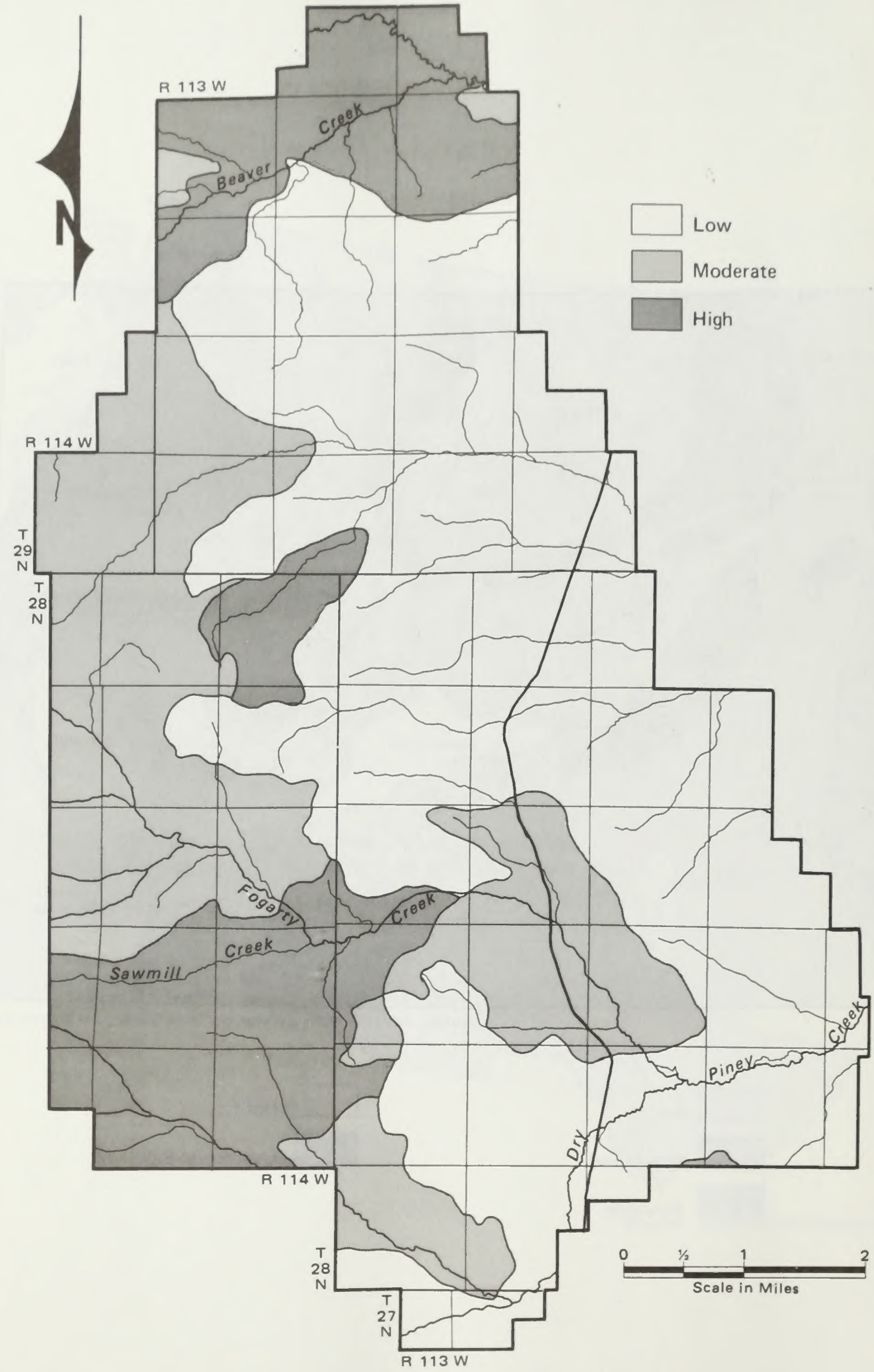
Source: Adapted from Fenneman, 1931.

Map 7
PHYSIOGRAPHIC PROVINCES —WYOMING



Source: Adapted from a Wyoming State Geological Survey map.

Map 8
VISUAL RESOURCES



Step 2—Applicability: Determine with cursory review the necessity of using visual resources in the process. There are two situations, either of which, if applicable, will require a complete visual resource analysis:

- If any existing or future drilling activity in the oil and gas field is visible and within a 3-mile range from a Federal or State road.
- If any Scenic Quality Rating Unit is rated a 12 or higher for scenic quality (see Figure 9).

The surveyor should conduct a preliminary scenic quality survey for terrain which appears to have the greatest scenic value.

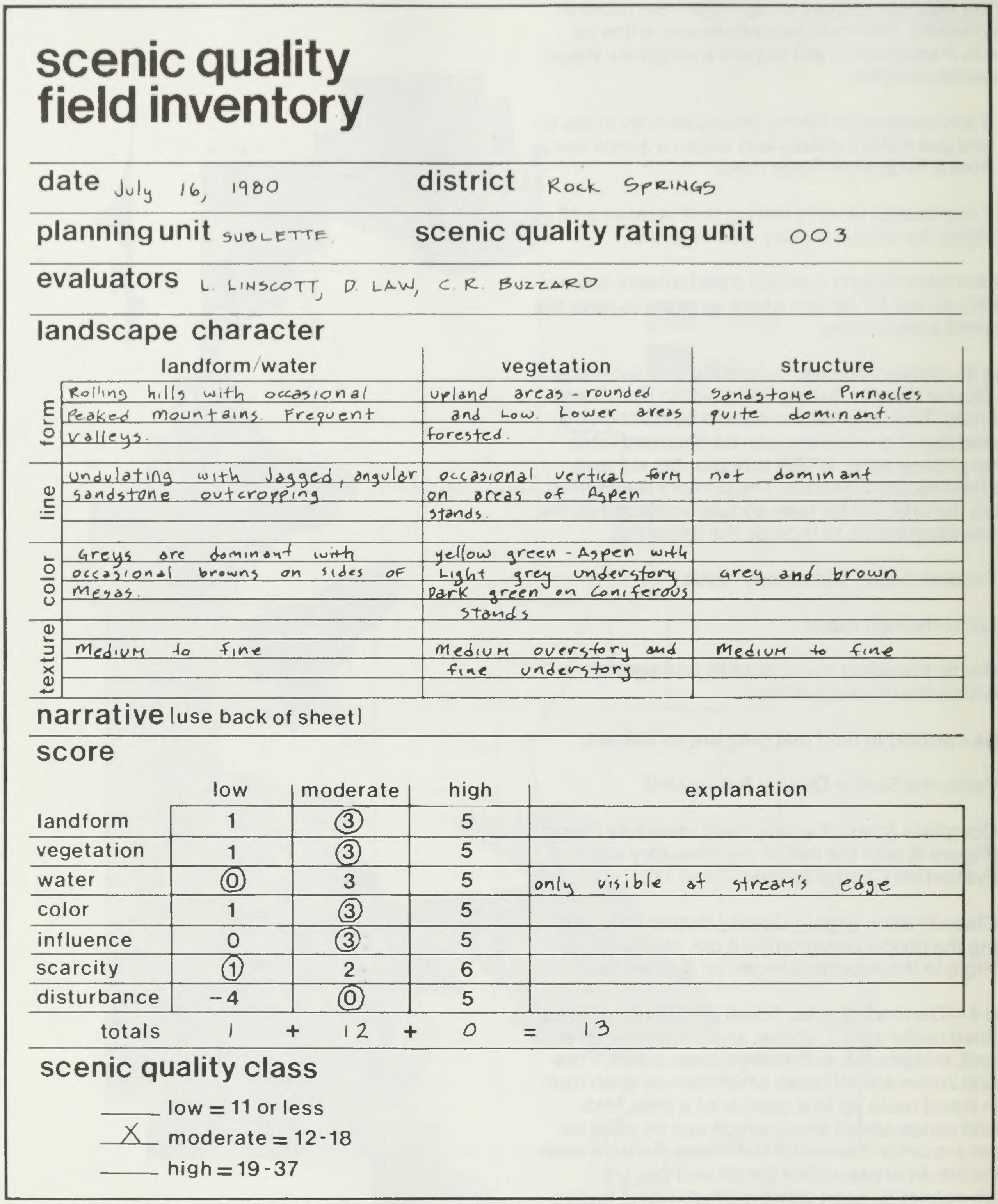
Step 3—Scenic Quality: Determine and delineate the Scenic Quality Rating Units within the oil and gas field. This information should be placed on a frosted mylar overlay and can be obtained from aerial photographs, USGS topographic surveys, and field reconnaissance. The primary roads from which the unit can be seen should be placed on the surrounding locale to include the following:

- Federal, State, and county roads
- Local through roads
- Roads providing major access and egress within the oil and gas field

Steps involved in field mapping are as follows:

- Verify the Scenic Quality Rating Unit
- Complete Scenic Quality Field Inventory Form (Figure 9) with the use of the Inventory and Evaluation Chart (Figures 10 and 11).
- Classify each Scenic Quality Rating Unit, placing the proper designation (Low, Moderate, or High) in the appropriate cell on the overlay.

Step 4—Distance Zones: Travel primary routes, as outlined under step 2, above, and determine foreground, midground, and seldom seen zones. Foreground zones are all areas which can be seen from each travel route up to a quarter of a mile. Midground zones are all areas which can be seen between a quarter mile and 3 to 5 miles. Seldom seen zones are all areas within the oil and gas unit which cannot be seen along primary travel routes.



scenic quality field inventory

date July 16, 1980 **district** Rock Springs

planning unit Sublette **scenic quality rating unit** 003

evaluators L. Linscott, D. Law, C. R. Buzzard

landscape character

	landform/water	vegetation	structure
form	Rolling hills with occasional Peaked mountains. Frequent valleys.	upland areas - rounded and Low. Lower areas forested.	Sandstone Pinnacles quite dominant.
line	undulating with Jagged, angular sandstone outcropping	occasional vertical form on areas of Aspen stands.	not dominant
color	Greys are dominant with occasional browns on sides of Mesas.	yellow green - Aspen with Light grey understory Dark green on Coniferous stands	grey and brown
texture	Medium to fine	Medium overstory and fine understory	Medium to fine

narrative (use back of sheet)

score

	low	moderate	high	explanation
landform	1	[✓ 3]	5	
vegetation	1	[✓ 3]	5	
water	[✓ 0]	3	5	only visible at stream's edge
color	1	[✓ 3]	5	
influence	0	[✓ 3]	5	
scarcity	[✓ 1]	2	6	
disturbance	-4	[✓ 0]	5	
totals	1 +	12 +	0 =	13

scenic quality class

___ low = 11 or less

X moderate = 12-18

___ high = 19-37

Figure 9
SCENIC QUALITY FIELD INVENTORY FORM

scenic quality inventory & evaluation chart

low = 0-11
moderate = 12-18
high = 19-37

key factors	rating criteria & score		
landform	Low, rolling hills, foothills or flat valley bottoms. Interesting detail landscape features few or lacking. 1	Steep canyons, mesas, buttes, cinder cones and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features present and interesting though not dominant or exceptional. 3	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. 5
vegetation	Little or no variety or contrast in vegetation. 1	Some variety of vegetation, but only one or two major types. 3	A variety of vegetative types as expressed in interesting forms, textures, and patterns. 5
water	Absent, or present, but not noticeable. 0	Flowing, or still, but not dominant in the landscape. 3	Clear and clean appearing, still, cascading white water, any of which are a dominant factor in the landscape. 5
color	Subtle color variations, contrast or interest; generally mute tones. 1	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. 3	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. 5
adjacent scenery	Adjacent scenery has little or no influence on overall visual quality. 0	Adjacent scenery moderately enhances overall visual quality. 3	Adjacent scenery greatly enhances visual quality. 5
scarcity	Interesting within its setting, but fairly common within the region. 1	Distinctive, though somewhat similar to others within the region. 2	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. 6
disturbance	Modifications are so extensive that scenic qualities are for the most part nullified or substantially reduced. -4	Scenic quality is somewhat depreciated by inharmonious intrusions, but not so extensive that the scenic qualities are entirely negated or modifications add little or no visual variety to the area. 0	Free from aesthetically undesirable or discordant sights and influences; or modifications add favorably to visual variety. 5

Rate for scenery under the most critical conditions (i.e., highest user peroid or season of use, sidelight, proper atmospheric conditions, etc.).

Values for each rating criteria are maxium and minimum scores only. It is also possible to assign scores within these ranges.

Figure 10
SCENIC QUALITY INVENTORY AND EVALUATION CHART

scenic quality rating criteria:

landform

Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental as the Grand Canyon, the Sawtooth Mountain Range in Idaho, and the Wrangell Mountain Range in Alaska, or they may be exceedingly artistic and subtle as certain badlands, pinnacles, arches and other extraordinary formations.

vegetation

Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller scale vegetational features which add striking and intriguing detail elements to the landscape; e.g., gnarled or windbeaten trees, Joshua trees, etc.

water

Water is that ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

color

Consider the overall color(s) of the basic components of the landscape (i.e., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "color" are variety, contrast and harmony.

adjacent scenery

Consider the degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-5 miles, depending upon verticality of topography, vegetative cover and other such factors. This factor is generally applied to units which would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

scarcity

This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery. The scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.

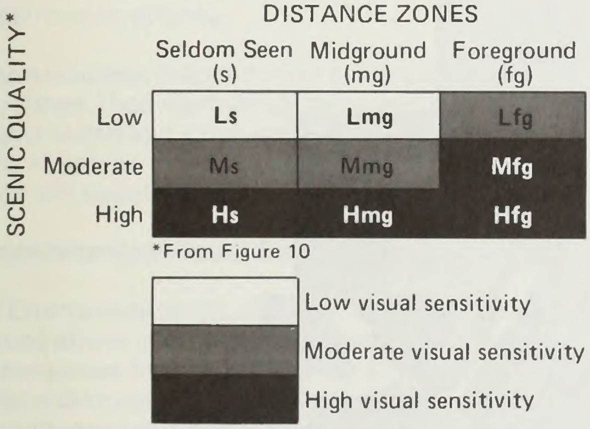
disturbances

Consider the impact of change on the visual quality of the characteristic landscape. Cultural modifications in the landform/water, vegetation and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or actually compliment or improve the scenery quality of a unit. Be careful not to confuse interest with scenery quality. Rate accordingly.

Figure 11
SCENIC QUALITY RATING CRITERIA

Step 5—Visual Sensitivity: Develop A composite of the Scenic Quality Inventory and Distance Zones to determine those areas where the public has visual access to a disturbance which has a significant adverse impact. Steps involved are as follows:

- Overlay Visual Quality and Distance Zones. (If possible, draw the Distance Zones over the SQRU's or on the back of the mylar containing the SQRU's.)
- Evaluate each cell created by the overlapping of the SQRU's and the Distance Zones based upon the Visual Sensitivity Matrix (Figure 12).
- Place the corresponding Visual Sensitivity Values (L, M, H) into the cells.
- Eliminate borders between cells of like value.
- Overlay a sheet of mylar and draw the new Visual Sensitivity Zones.
- Check to ensure that there are no adjacent zones of the same value. If there are, create a single zone.



DISTANCE ZONES

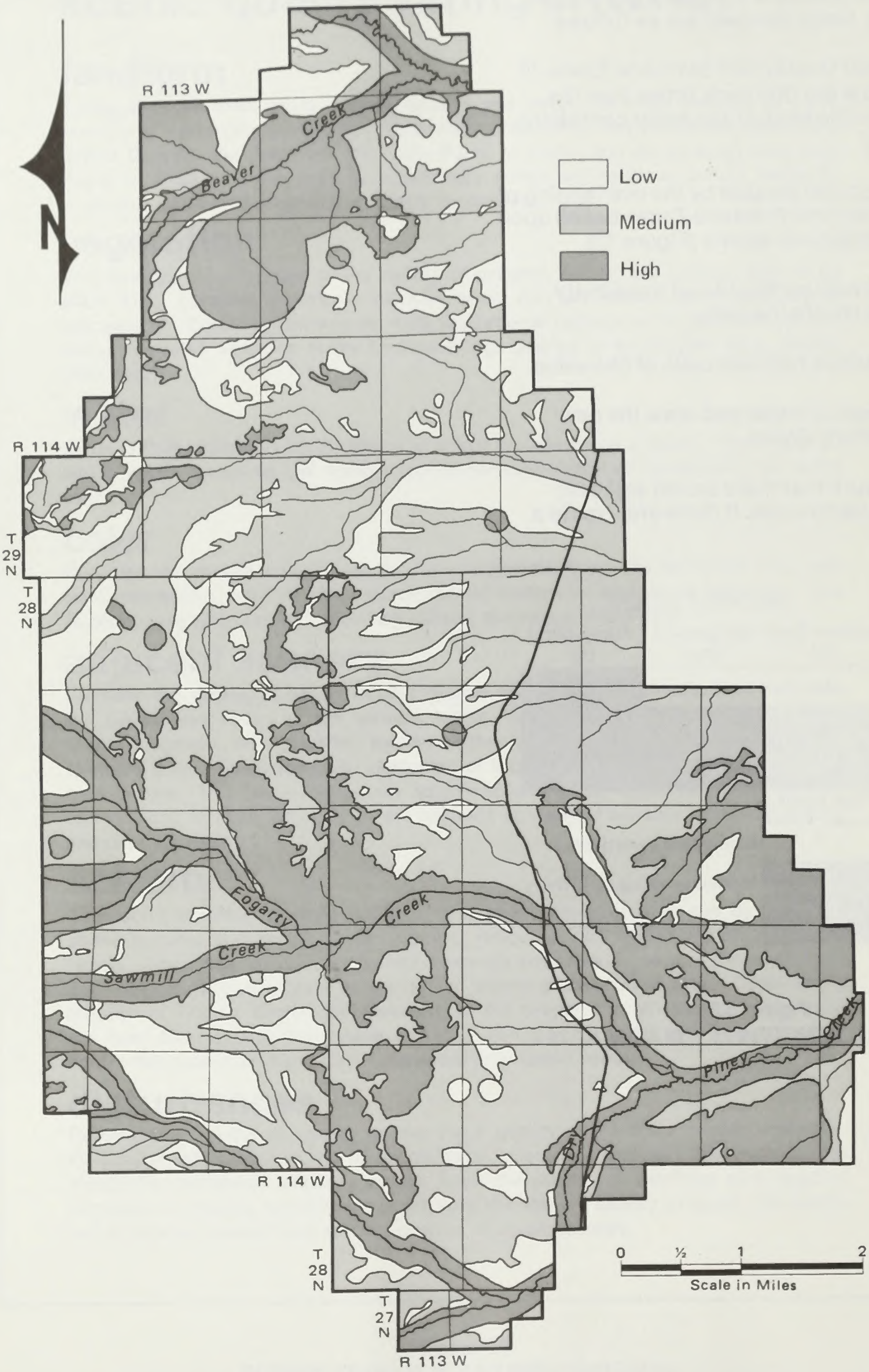
SCENIC QUALITY*	Seldom Seen (s)	Midground (mg)	Foreground (fg)
Low	Ls	Lmg	Lfg
Moderate	Ms	Mmg	Mfg
High	Hs	Hmg	Hfg

*From Figure 10

⬜	Low visual sensitivity
▨	Moderate visual sensitivity
⬛	High visual sensitivity

Figure 12
VISUAL SENSITIVITY MATRIX

Map 9
ENVIRONMENTAL SENSITIVITY COMPOSITE



MAPPING TECHNIQUES—COMPOSITES

ENVIRONMENTAL SENSITIVITY

All the resource overlays, including slopes, soils, water resources, and wildlife (visual resources excluded at this point in the process) should be cross-referenced to graphically portray a range of sensitivity levels on each resource. The purpose of the Environmental Sensitivity Composite is to bring each of the overlays together into a single drawing which will illustrate all the ranges of sensitivity within the area. This drawing is particularly valuable in assessing environmental problems when Applications for Permit to Drill are filed. If a proposed development falls into a sensitive area, the compliance officer is able to quickly assess the nature of potential problems and propose development guidelines which will enhance future rehabilitation.

There are several ways that the composites could be made. If the overlays are fairly simple in detail, then a cursory linking of like tones into cells would probably suffice, especially since only three tones are required. These are low, moderate, and high sensitivity which is also an indication of the rehabilitation priority.

If the resources mapped offer a complex variety of gray tones, then each small cell may have to be given a numerical value and then linked accordingly. However, the visual linkage or grouping of tones will usually suffice.

Environmental/Visual Sensitivity

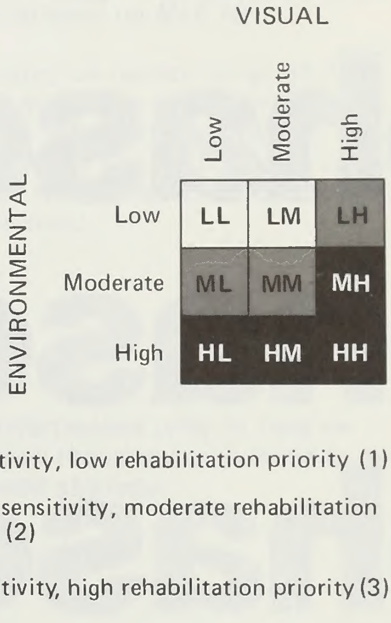
The Environmental Sensitivity Composite as described above should be composited with the visual resources in order to develop a final plat. When surface disturbances as described under PHASE II are compared with the Environmental/ Visual Sensitivity Plan, then rehabilitation plans can easily be formulated.

The Environmental/Visual Sensitivity Composite is easily developed by overlaying one base (Environmental Sensitivity) with the other (Visual Resources). Since each of the initial overlays is made up of three tones each, the total possible number of tones equals nine. The matrix on Figure 13 shows how the nine tones should be converted to three for efficient planning and ease of interpretation.

After the various cells have been identified and labeled in pencil onto the frosted mylar, the cells with the same rating are linked together. The final rating is then inked on the mylar and implemented into PHASE II of the rehabilitation process.

ENVIRONMENTAL SENSITIVITY

The process as outlined on the left is precisely how this drawing was made on Tip Top. When each of the overlays was put together, quite a number of gray tones emerged. Areas with 0-2 tones were given a low rating. Areas with enough shades to produce a near black were given a high rating, and all neutral grays were given a medium rating. This product is illustrated on Map 9.



			VISUAL	
		Low	Moderate	High
ENVIRONMENTAL	Low	LL	LM	LH
	Moderate	ML	MM	MH
	High	HL	HM	HH

□ Low sensitivity, low rehabilitation priority (1)

▒ Moderate sensitivity, moderate rehabilitation priority (2)

■ High sensitivity, high rehabilitation priority (3)

Figure 13
ENVIRONMENTAL/VISUAL
SENSITIVITY MATRIX

phase II
phase II
phase II
phase II
phase II
phase II

PHASE II

DEVELOPMENT OF SECTOR BASE MAP

Step 1—Recommend a specific scale and the legal descriptions for sectors (if necessary) for the development of field base maps. In many instances the unit will be divided into sectors (see Map 10) depending upon the following factors:

- The intensity of disturbances in a given area
- The size of the oil and gas unit
- The number of problems necessitating an abundance of graphic entries on the map; i.e., general conditions of disturbances in the oil and gas unit

Step 2—Produce a photo positive of the USGS quad and sectors. Then enlarge to an appropriate scale.

Step 3—Draft the final environmental/visual sensitivity onto an original frosted photo positive of the enlarged USGS quad and produce two frosted mylar prints.

Step 4—Provide one copy (or set of copies if sectors) of the original Environmental/Visual Sensitivity Composite to remote sensing personnel who then draft disturbances as shown on recent aerial photographs.

Step 5—Complete the following:

- One copy of the enlarged plats showing topography, environmental/visual sensitivity, and disturbances
- One copy of the enlarged plats showing topography and environmental/visual sensitivity

Step 6—Use the map with disturbances recorded for the base map in the field. Verify and make additions and deletions as appropriate on this map during field inventory.

Step 7—Use the map without disturbances recorded for drafting final priority plan which will be used for preplanning by both BLM and operators.

DEVELOPMENT OF SECTOR BASE MAP

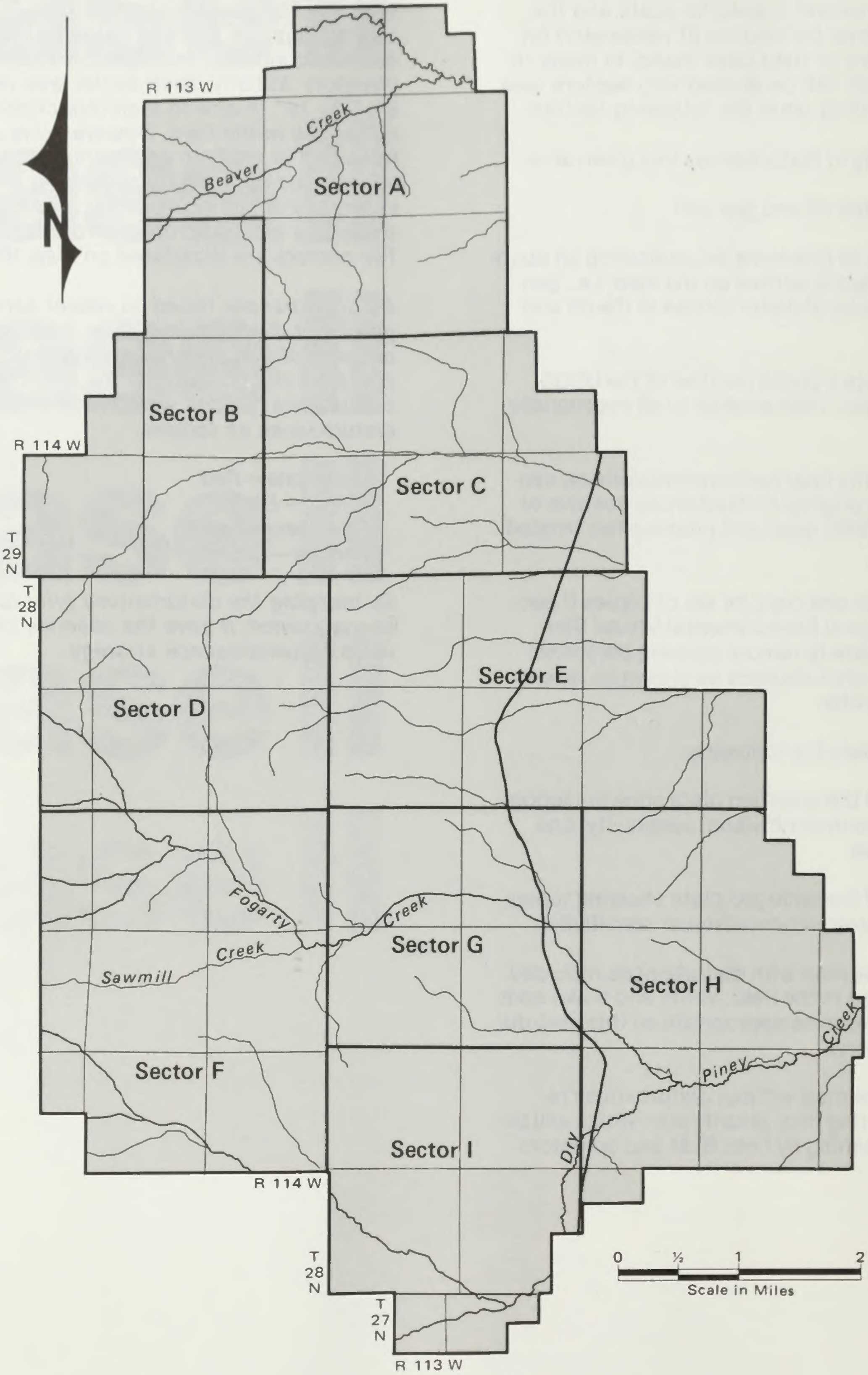
With Tip Top containing more than 33,000 acres, it is appropriate that the entire field be broken down into smaller, manageable sectors for field inventory. Initially, each sector was reduced to 8½" by 14" in size to facilitate clipboard reconnaissance in the field. However, this proved to be too small in scale to adequately record all disturbances and appropriate mitigating measures, especially in highly disturbed areas. A 1" = 1,000' scale was most appropriate for the Tip Top Unit. The sectors are illustrated on Map 10.

All disturbances found on recent aerial photographs of the field were then drawn onto a print of the sector. It was not always possible to interpret from the photograph the exact nature of the disturbance. Efforts were made to color code disturbances as follows:

Locations—Red
Roads—Blue
Pipelines—Brown
Fences—Green

By mapping the disturbances prior to field reconnaissance, it gave the observer criteria to develop reconnaissance strategy.

Map 10
SECTOR LOCATION



PREPARATION FOR FIELDWORK

Step 1—Develop a field graphic base with the use of the base map (Step 1-6,) and a frosted mylar overlay. Depending on the sheet size, one may utilize an 8½ by 11 inch notebook or a clipboard to hold maps while in the field.

Step 2—Organizes travel strategy to determine the sequence by which sectors should be studied and the appropriate routes to follow.

Step 3—Just prior to conducting the field inventory, assemble the Field Logbook. This consists of field maps (8½ by 11 inches in size) and the Maintenance and Rehabilitation Logsheet shown in Figure 14.

CONDUCTING FIELD INVENTORY

Conduct a field inventory, recording disturbances and recommending solution in two forms—on the field base map and on the logsheet.

FIELD BASE MAP

The staff conducting the inventory is to verify and identify each disturbance by adding, deleting, or amending information from the aerial photography as it is recorded on the field base sheet. When a disturbance has been identified with no evident problems or which has been totally rehabilitated, the disturbance should be traced in blue (on the mylar overlay) or black if it is a road that is in no need of maintenance. If a problem does exist, trace the disturbance in orange and assign a reference number to the disturbance for explanation on the logsheet. When the disturbance poses an imminent safety hazard or presents irreparable environmental damage, it should be traced in red and also be given a reference number.

MAINTENANCE AND REHABILITATION LOGSHEET

The following steps should be used in completing the logsheet (see Figure 14):

Step 1—Enter the appropriate reference number as it corresponds to the field base map.

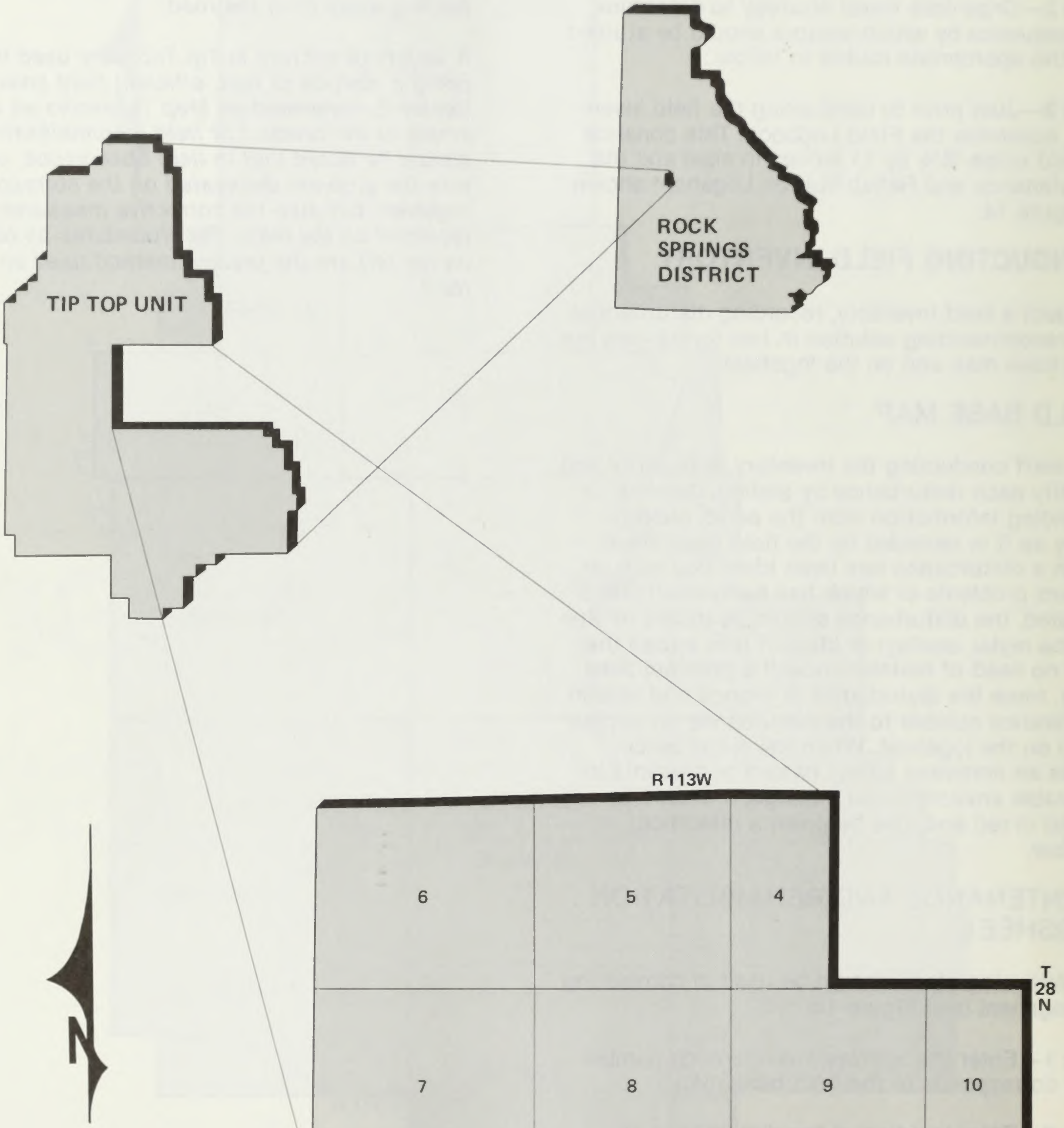
Step 2—Enter location of the disturbance by quarter and section. If the field is divided into sectors, then each logsheet should be labeled by unit and sector.

PREPARATION FOR FIELDWORK

Various methods of field reconnaissance were attempted and some proved more successful than others. It is recommended that the helicopter be utilized in determining the status of pipelines in remote locations (away from roads). Field glasses were extremely valuable on pipelines extending away from the road.

A variety of sectors in Tip Top were used in developing a method of fast, efficient field inventory. Sector E, illustrated on Map 11, serves as an example of the product of field reconnaissance. It should be noted that in field observance, not only was the problem delineated on the corresponding logsheet, but also the corrective measures were recorded on the map. The procedures as outlined on the left are the precise method used on Sector E.

Map 11
SECTOR E LOCATION



MAINTENANCE & REHABILITATION LOG

UNIT: TIP TOP - SEC. E
NAME: LAW & LINSOTT

APPROVED BY:

PAGE: 1
DATE: 23 JULY 80

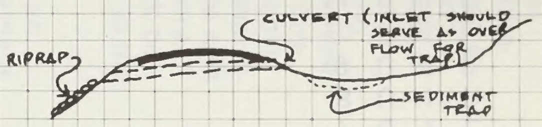
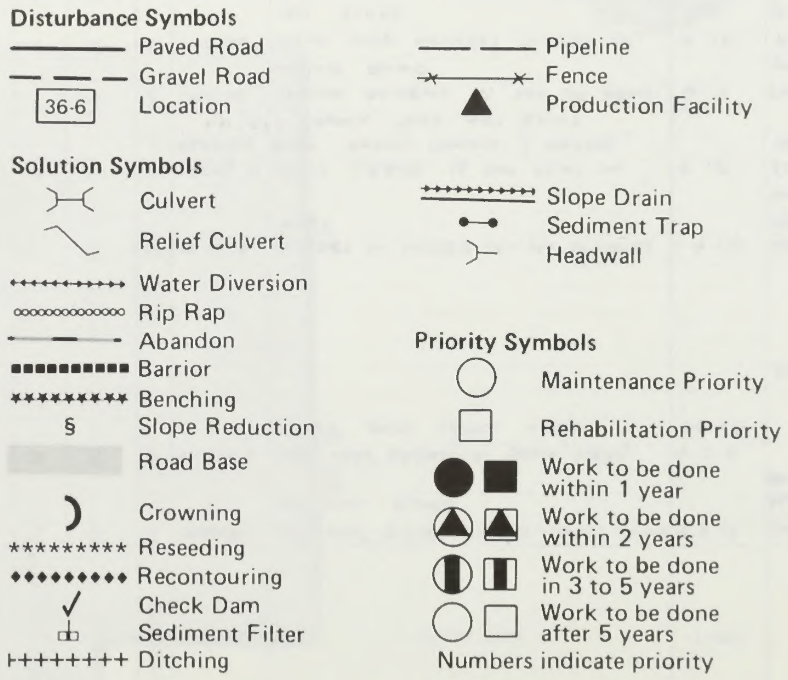
DISTURBANCE							PROBLEM		SOLUTION / MITIGATION			
REFERENCE NUMBER	LOCATION	MAINTENANCE/ REHABILITATION	CLASSIFICATION	ENVIRON/VISUAL SENSITIVITY	TYPE	PRIORITY	TYPE	SITUATION	TYPE	DESCRIPTION	COMPLETION DATE	CHECKED BY
1	SE-8	M	U	3	R	2	EROSION	SEE MAP. STEEP SLOPES - GULLY DOWN ON FILL SLOPE	4.3.13	RIPRAP ALONG GULLY; CLEAN OUT & DEEPEN DITCH ALONG CUT SLOPE TO CREATE MORE POSITIVE DRAINAGE; IMPROVE EXISTING WATERBAR.		
2	SE-8	M	U	2	R	5	SILTING	SEE MAP. ERODIBLE SOILS, STEEP, SLOPE ONTO LEVEL AREA	4.2.11.14.18	 CULVERT (INLET SHOULD SERVE AS OVER FLOW FOR TRAP) RIPRAP SEDIMENT TRAP NOTE: INCREASE GRADIENT ALONG ROAD DITCH		
3	SE-8	M	U	1	R	8	SILTING	CULVERT IS SILTED IN - NO DITCHING FLAT	1.4.16	REPLACE CULVERT AT 2-3% SLOPE; SED. TRAP ON UPHILL SIDE (CULVERT AS OVERFLOW); RIPRAP AT OUTLET.		
4	SE-8	M	U	3	R	2	SILTING & EROSION	ROAD GRADE IS TOO FLAT IN SPOTS CAUSING POOLING & SILTING, A CROWN DOES NOT EXIST.	9.10	ROAD BASE MATERIALS ARE NEEDED TO BUILD UP A CROWN.		
5	SE-8	R	U	1	R	8	EROSION	EROSION OCCURING AT TOP OF ABANDONED ROAD	6.11	PREVENT TRAFFIC, SEED AT TOP OF SLOPE ONLY.		
6	SE-8	M	U	1	R	8	SILTING	DITCH AND CULVERT SILTED IN; NO SLOPE.	4.16	REDITCH - PUT AT STEEPER GRADIENT, RIPRAP BASE OF DITCH, SED. TRAP AT HEAD OF CULVERT		
7	SW-9	R	P	1	L-13.9	16	EROSION	HIGH WALL IS ERODING (DEEP RILLS) SE CORNER OF CUT IS OBTRUSIVE AND NOT NEEDED.	4.12.3.11	RIPRAP IN RILLS; DIVERT WATER ON TOP OF HIGH WALL; RECONTOUR SE CORNER TO MEET EXISTING TOPO; SEED.		
8	NW-8	M	U	2	R	5	ROUGH ROAD	ROAD IN USE; NO BASE, FLOODED, VERY BUMPY	9.10.1	PUT IN ROAD BASE TO ELEVATE & SMOOTH; CROWN; PUT IN CULVERT WHERE DRAINAGE MEETS ROAD.		
9	NW-8	M	U	2	R	5	ROUGH	ROAD IN USE, NO BASE, BUMPY	9.10	PUT IN ROAD BASE & CROWN.		
10	SE-5	R	P	2	P	15	EROSION	CAUSED BY TIRE RUTS ALONG PIPELINE & STEEP SLOPES - EROSION SLIGHT	6	BARRIER EXTENSION OF ACCESS ROAD NOT TO BE CONSIDERED ABANDONED.		
11	NE-8	R	P	2	P	15	EROSION	CAUSED BY STEEP SLOPES; POOR ERODIBLE SOILS; NO VEGETATION	3.11.12	PLACE WATERBARS ALONG PIPELINE ON SLOPE (1- AT TOP, 2- MIDWAY, 3- NEAR BASE); REGRADE & SEED.		

Figure 14
MAINTENANCE AND REHABILITATION LOG - FIELD

LEGEND



Priority	Classification	Env./Vis. Sensitivity	Type
S	Safety		
1	U	3	L
2	U	3	R
3	U	3	P
4	U	2	L
5	U	2	R
6	U	2	P
7	U	1	L
8	U	1	R
9	U	1	P
10	P	3	L
11	P	3	R
12	P	3	P
13	P	2	L
14	P	2	R
15	P	2	P
16	P	1	L
17	P	1	R
18	P	1	P

(Back of Figure 14)
MAINTENANCE AND REHABILITATION LOG - FIELD

Step 3—All disturbances will fall into either a maintenance problem or a rehabilitation problem. A *maintenance* problem is any situation that needs attention to ensure continued use. One of the most prevalent maintenance problems is erosion occurring on a road base or in a road ditch. A *rehabilitation* problem is any situation that needs attention to ensure successful rehabilitation. It may be difficult to distinguish between a maintenance and a rehabilitation problem on areas being rehabilitated. Determine the cause of a particular problem. If, because of natural phenomena, erosion, sedimentation, or vegetation decline is occurring on facilities which are in use at the time, then it is a maintenance item. However, if the problem is the result of poor rehabilitation practices, then it is classified as a rehabilitation problem. In all cases, the decision lies with the field worker as to the appropriate category, but the main objective is to ensure that work be done in order to satisfy both needs and not to the exclusive benefit of one.

Place an "M" for maintenance problems or an "R" for rehabilitation problems in the appropriate column on the log sheet.

Step 4—Classify all disturbances according to their state of rehabilitation.

Totally rehabilitated is any disturbance that has been abandoned with erosion and sedimentation controlled and revegetation successfully completed.

The *partially rehabilitated* classification includes any one of the following criteria:

- Incomplete rehabilitation
- Roads that are not in use and which have begun to rehabilitate naturally
- Rehabilitation which has failed slightly such as a waterbar that has breached and erosion is occurring, or if an additional waterbar is needed because too few were used initially

The *unrehabilitated* classification includes any situation meeting any of the following criteria:

- No previous rehabilitation work has been done
- Roads which are under use
- Where rehabilitation work has failed significantly

Since a totally rehabilitated situation should be free of problems in the field, there is no need to enter the disturbance on the logsheet. However, the other classifications are to be recorded with a "P" in the "classification" column for a partially rehabilitated situation and a "U" for those that are considered to be "unrehabilitated." The status of each situation lies at the discretion of the field worker, but a priority of work will be given to unrehabilitated status.

Step 5—Enter the environmental/visual sensitivity number that corresponds to the shade of the area on the base sheet. This could easily be done in either the field or the office following field inventory.

Step 6—Under "Type" of disturbance, record "L" for locations and add the location number for each well; "R" for roads; "P" for pipelines; and "M" for miscellaneous types of disturbances.

Step 7—Enter the priority number corresponding to classification, environmental/visual sensitivity, and type of disturbance and associated numbers as follows:

Priority	**Classification**	**Env./Vis. Sensit.**	**Type**
S	**Safety**		
1	U	3	L
2	U	3	R
3	U	3	P
4	U	2	L
5	U	2	R
6	U	2	P
7	U	1	L
8	U	1	R
9	U	1	P
10	P	3	L
11	P	3	R
12	P	3	P
13	P	2	L
14	P	2	R
15	P	2	P
16	P	1	L
17	P	1	R
18	P	1	P

This chart, along with appropriate mapping symbols, is delineated on the back of each Maintenance and Rehabilitation Logsheet for easy reference (see Figure 14). The priority can either be set in the field or in the office.

Step 8—Enter the type of problems. This can include erosion, siltation, visual, etc.

Step 9—Enter notes concerning the situation relating to conditions and causes. This can include:

— Specific location, if necessary

— Soil conditions

— Slope conditions

— Photograph numbers, if taken (P-13, P-14)

Step 10—Enter the type of recommended solution. Place numbers of the solutions corresponding to the graphic legend on the back of the logsheet.

Step 11—Enter notes and graphics concerning the solution of each particular problem. This may include, but not be limited to:

— Spacing of particular erosion control elements, which can be graphic and/or written.

— Materials to be used.

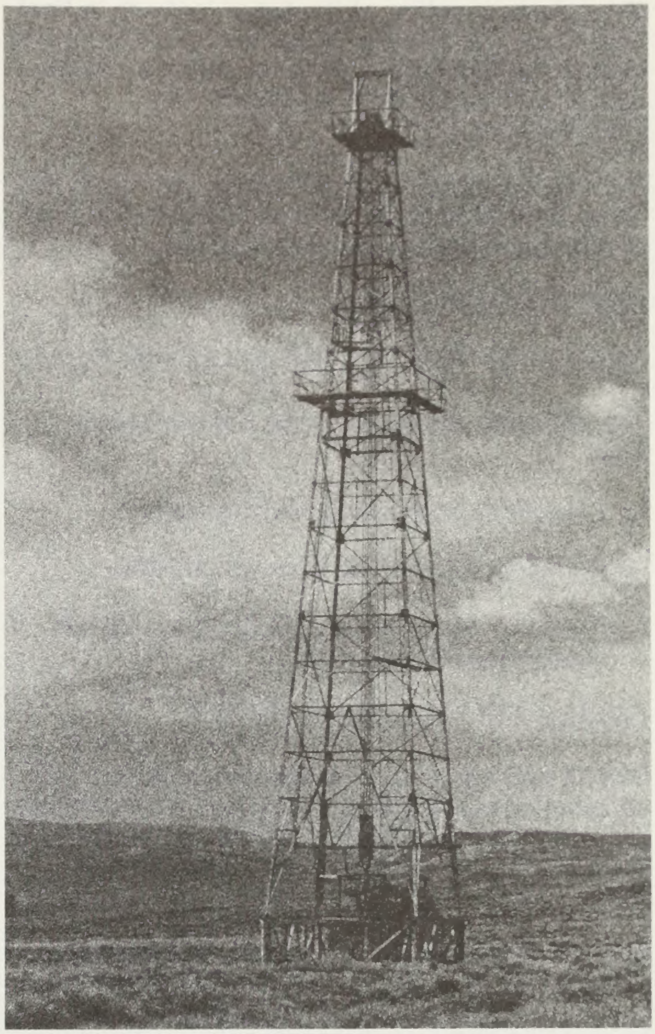
— Specific locations of control elements (graphic and/or written).

Step 12—All solutions should also be recorded in the appropriate locations on the field base map as it corresponds to the logbook.

MAPPING AND PLANNING

Following the field inventory, the logbook must be edited and conditioned for final decisionmaking regarding a rehabilitation plan. It is likely that the logbook is less than legible from notetaking in the oil field. Therefore, it is suggested that the logsheet be rewritten for thoroughness and legibility.

The logbook information is then typed onto two lists, maintenance and rehabilitation, for the entire field with the highest priority listed first in each case. Combine the sectors into one set of rehabilitation problems and one set of maintenance problems if the sectors are few in number (1-3) and the number of problems in the sectors is not too numerous. This is to ease the use of the logbook in the field and to eliminate confusion and misunderstandings regarding the work to be done by the operator. These forms are then edited and resubmitted for corrections (see Figure 15).



MAPPING AND PLANNING

Using the chart on the back of Figure 14 as a basis for establishing priorities for the Tip Top Unit, Sector E was redrawn on a final map (Map 12). The logsheet was retyped in order of highest priority to lowest. These are to be presented to the operator for review. The operator, GS, and the surface protection specialist, can establish time frames in which the work is to be completed. This, along with an agreement that describes a schedule of work, constitutes a rehabilitation plan.

The solution section of the typed logbook is finalized. On a site specific basis, decisions are made in both the field and later in the office as to the use of appropriate BLM standards and specifications.

Draft the graphics on logsheets according to the above BLM standards and specifications. A final priority plan is produced (see Map 12).

IMPLEMENTATION

GOALS OF THE REHABILITATION PLAN

The following are goals of the Rehabilitation Plan:

- Complete necessary work by priority.
- Complete all work as soon as possible.
- Provide a cooperative atmosphere in which alienation will not occur.

GOALS OF THE OPERATOR

The oil and gas field operator will want to make efficient use of available resources. Compromise and cooperation between both parties should produce a viable rehabilitation and maintenance plan.

In a meeting between the surface management agency, the operator, and Geological Survey, decisions are made and recorded regarding time frames, priorities, and work to be completed.

The rehabilitation plan is based on three major criteria. First, the plan should be responsive to priorities as established. Secondly, the operator's budget should be taken into consideration when developing a plan. The final consideration relates to the proximity of each disturbance, especially if the operator desires to group work in a geographical area.

COMPOSING A PLAN

The following is a recommended cooperative agreement to be used in planning and scheduling the implementation of the maintenance and rehabilitation plan:

The following individual, ______________________________
____,
is authorized by _____________________________________
____
____,
hereafter called the operator, to negotiate and enter into agreement with the Bureau of Land Management, hereafter called BLM, and U.S. Geological Survey, hereafter called GS.

The operator agrees to the following terms concerning the maintenance and/or rehabilitation of the oil and/or gas unit or portion of the oil and/or gas field described on the Rehabilitation Priority Plan.

a. The operator will earnestly enter into negotiation with GS and BLM as to an agreement whereby the solutions to the stated problems enumerated on the Rehabilitation Priority Plan will be executed in accordance to their associated priority, in accordance to specified methods and materials, and within the agreed schedule of completion.

b. The completion date will be a calendar year noted by the operator.

c. The first calendar year will be the calendar year of the date of agreement located on the front of this sheet if the date of agreement is before July 1; otherwise, the first year completion date will be the calendar year following the year of said date of agreement. The remaining work to be accomplished will be scheduled for the second calendar year, third through fifth calendar year, and beyond the fifth calendar year.

d. Any problem designated by GS and BLM as a safety hazard and brought to the attention of the operator will be attended by the operator without undue or unreasonable delay. This includes those problems enumerated and so designated or which may be detected following the date of agreement.

e. At the end of the first and second calendar year completion dates, the operator, GS, and the BLM will review all work not yet executed to include previously scheduled work which for good reason remains unattended, work originally scheduled beyond the second calendar year completion date, and any new work resulting from problems occurring after said date of agreement. The result of this review will be the rescheduling of all work to be accomplished by the process previously described in items a, b, and c.

f. Should the operator, GS, and the management agency agree to a schedule for implementing the solutions to the problems found on the Rehabilitation Priority Plan, the authorized representative of the operator will sign on the blank line titled "Approved by," thus agreeing to the terms of this agreement.

MAINTENANCE & REHABILITATION LOG

UNIT: Tip Top
NAME: Law & Linscott

APPROVED BY: ____________

PAGE: 1
DATE: 7/23/80

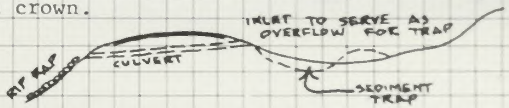
DISTURBANCE						PRIORITY	PROBLEM		SOLUTION / MITIGATION			CHECKED BY
REFERENCE NUMBER	LOCATION	MAINTENANCE/ REHABILITATION	CLASSIFICATION	ENVIRON/VISUAL SENSITIVITY	TYPE		TYPE	SITUATION	TYPE	DESCRIPTION	COMPLETION DATE	
1	SE-7	M	P	2	L-44-7	S	Subsidence	Not compacted; settlement causing a depression in center of pad.	9	Place and compact good material.		
2	SE-8	M	U	3	R	2	Erosion	See map; steep slopes; gully down on fill slope.	4-3-13	Riprap along gully; clean out and deepen ditch along cut slope to create more positive drainage, improve existing water bar.		
3	SE-8	M	U	3	R	2	Silting & Erosion	Road grade is too flat in spots which causes pooling and silting because a crown does not exist.	9-10	Road base materials are needed to build up a crown.		
4	SE-8	M	U	2	R	5	Silting	See map; erodible soils; steep slope onto level area.	4-2-11 14-18	 RIP RAP CULVERT INLET TO SERVE AS OVERFLOW FOR TRAP SEDIMENT TRAP		
5	NW-8	M	U	2	R	5	Rough	Road in use; no base; flooded; very bumpy	9-10-1	Note: Increase gradient along road ditch. Put in road base to elevate and smooth crown; put in culvert where drainage meets road.		
6	NW-8	M	U	2	R	5	Rough	Road in use; no base; bumpy.	9-10	Put in road base and crown.		
7	NW-7	M	U	2	R	5	Erosion	On cut slope ditch, mod.	2-4	Place relief culvert (w/headwall as check dam) and riprap at outlet.		
8	NW-7	M	U	2	R	5	Erosion	On cut slope ditch, mod. slopes; erodible soil.	13	Check dams (rock) evenly spaced between culvert (proposed) & L-12-7 (place last one at intersection of pad and ditch.		
9	NW-7	M	U	2	R	5	Erosion	Continuation of work on L-12-7 (see map).	2-13-1	See diagram for L-12-7.		
10	NW-7	M	U	2	R	5	Erosion	In ditch on cut slope.	4	Riprap culvert; check dam (rocks) if necessary.		
11	NW-7	M	U	2	R	5	Erosion	Slight erosion on cut side.	13	Place check dams where indicated on map. (1-top of slope, 2-mid slope, 3-where slope noticeably decreases in gradient.) Use rock.		

Figure 15
MAINTENANCE AND REHABILITATION LOG - FINAL

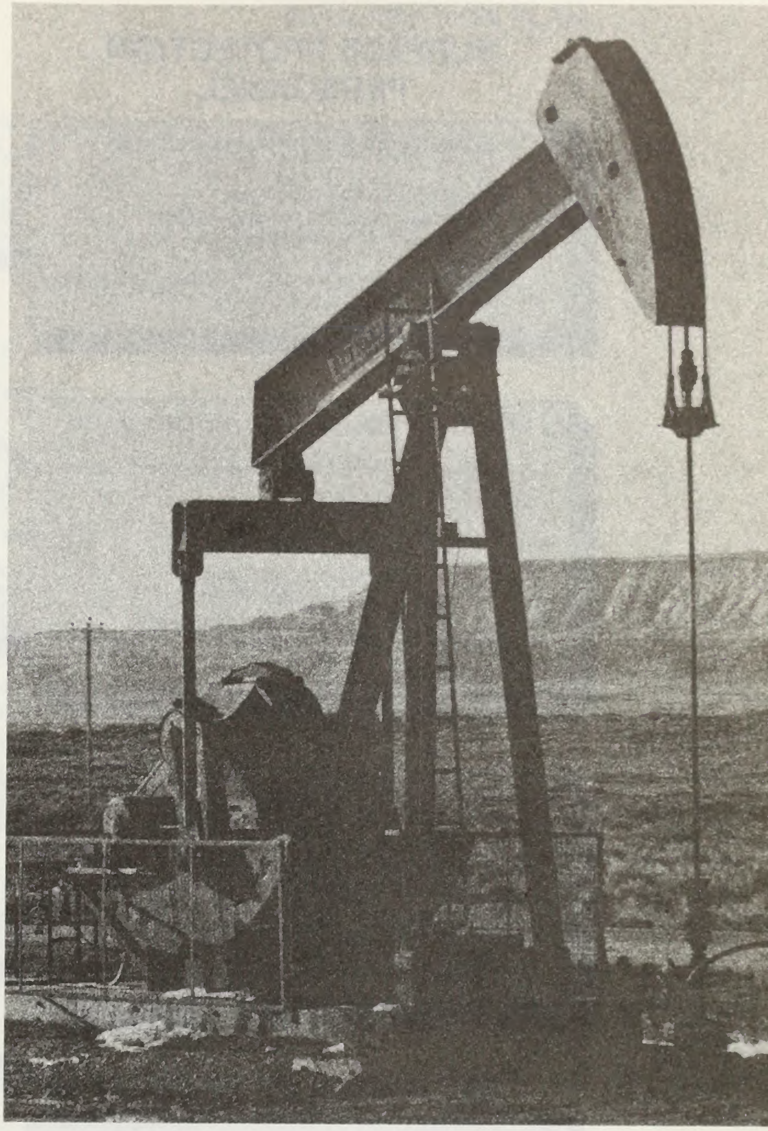
EVALUATION, REVIEW, AND UPDATE

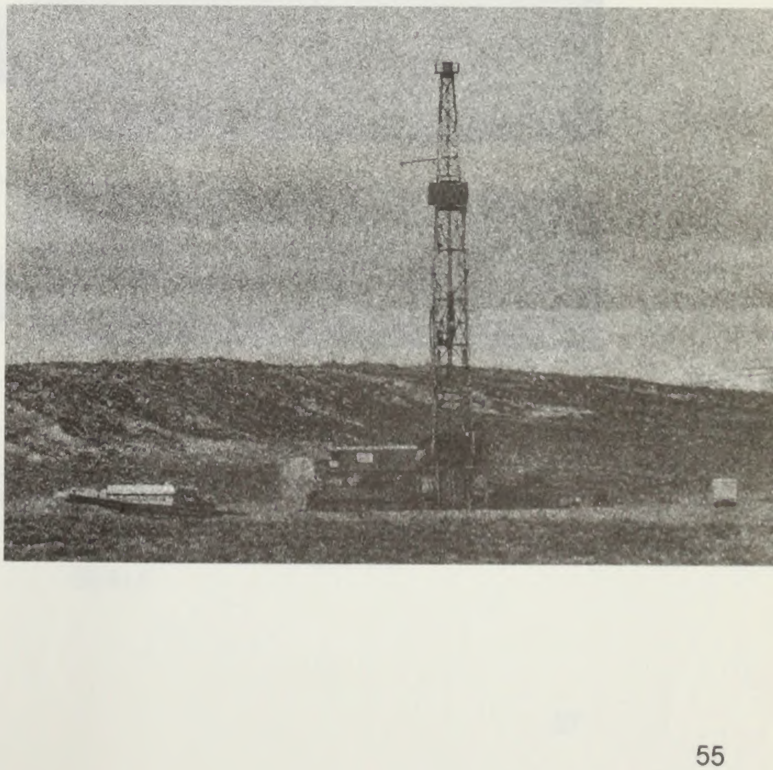
Insert the above document into the logbook and check off work as it is accomplished. Also, as in the original survey, any new problems occurring on separate log sheets should be noted. This can be accomplished during the normal course of events occurring in compliance work on any unit. However, it is recommended that the entire unit be covered at least once a year to ensure that scheduled work is accomplished, new problems (which should be minimal) are noted, and new safety hazards are recorded and dealt with as soon as possible. At the end of the original 2-year period, BLM should provide the operator with a revised maintenance and rehabilitation plan for the following 2 years.

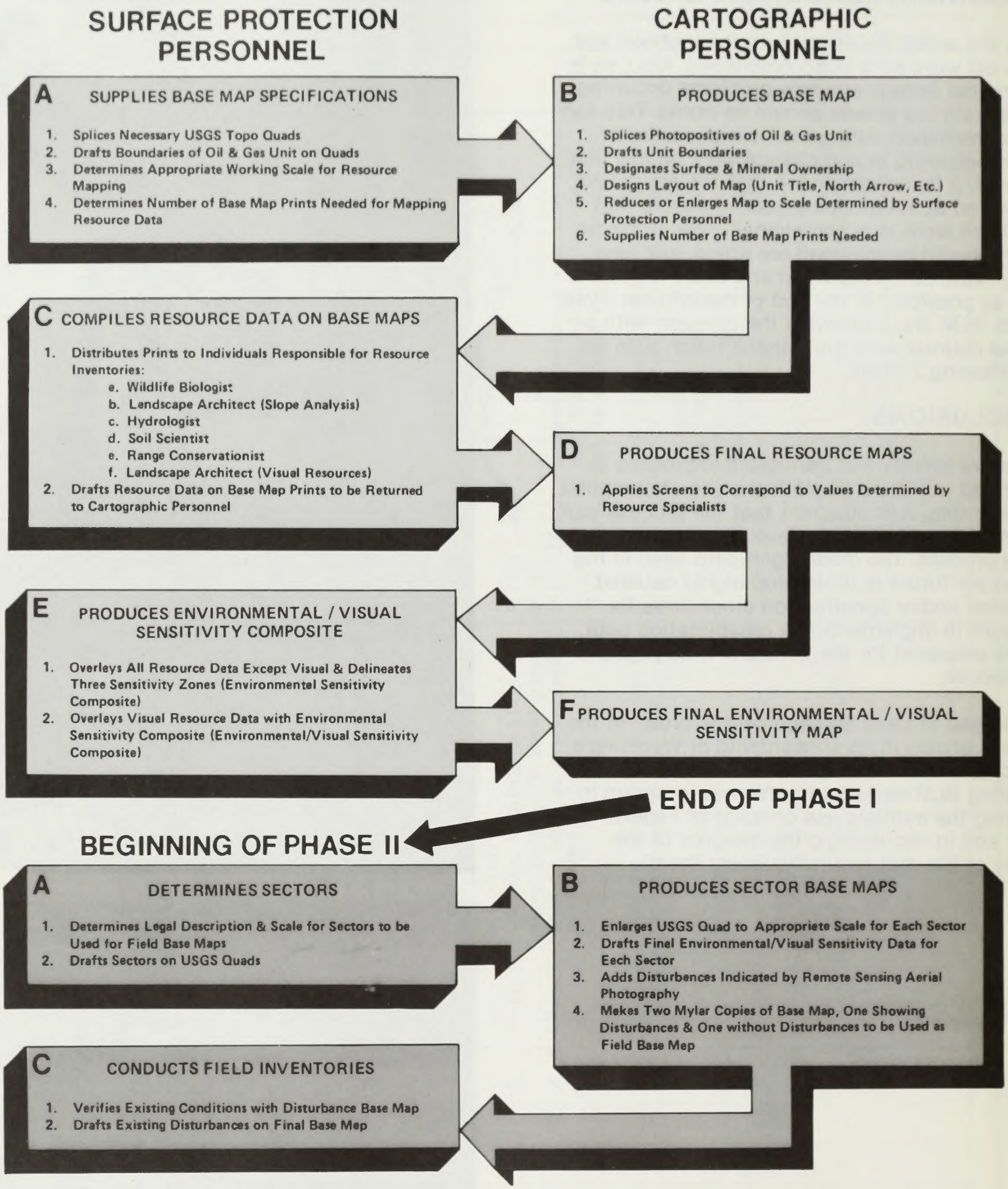
CONCLUSIONS

The entire overlay and cartographic process is illustrated in Figure 16. With the use of computer programming, it is apparent that the process can be streamlined to further develop a final rehabilitation process. The most significant need in the immediate future is to develop highly detailed operation and/or construction procedures for fieldwork in implementing a rehabilitation plan. This is proposed for the third and final phase of the process.

The Bureau of Land Management is proud of the success shown in its stewardship of Wyoming's public lands. It is with great expectation that the Wyoming BLM embarks on this new program in ensuring the multiple use concept of Federal lands and in maintaining the integrity of the quality of life that naturally occurs there.







SURFACE PROTECTION PERSONNEL

CARTOGRAPHIC PERSONNEL

A SUPPLIES BASE MAP SPECIFICATIONS

1. Splices Necessary USGS Topo Quads
2. Drafts Boundaries of Oil & Gas Unit on Quads
3. Determines Appropriate Working Scale for Resource Mapping
4. Determines Number of Base Map Prints Needed for Mapping Resource Data

B PRODUCES BASE MAP

1. Splices Photopositives of Oil & Gas Unit
2. Drafts Unit Boundaries
3. Designates Surface & Mineral Ownership
4. Designs Layout of Map (Unit Title, North Arrow, Etc.)
5. Reduces or Enlarges Map to Scale Determined by Surface Protection Personnel
6. Supplies Number of Base Map Prints Needed

C COMPILES RESOURCE DATA ON BASE MAPS

1. Distributes Prints to Individuals Responsible for Resource Inventories:
    - a. Wildlife Biologist
    - b. Landscape Architect (Slope Analysis)
    - c. Hydrologist
    - d. Soil Scientist
    - e. Range Conservationist
    - f. Landscape Architect (Visual Resources)
2. Drafts Resource Data on Base Map Prints to be Returned to Cartographic Personnel

D PRODUCES FINAL RESOURCE MAPS

1. Applies Screens to Correspond to Values Determined by Resource Specialists

E PRODUCES ENVIRONMENTAL / VISUAL SENSITIVITY COMPOSITE

1. Overlays All Resource Data Except Visual & Delineates Three Sensitivity Zones (Environmental Sensitivity Composite)
2. Overlays Visual Resource Data with Environmental Sensitivity Composite (Environmental/Visual Sensitivity Composite)

F PRODUCES FINAL ENVIRONMENTAL / VISUAL SENSITIVITY MAP

END OF PHASE I

BEGINNING OF PHASE II

A DETERMINES SECTORS

1. Determines Legal Description & Scale for Sectors to be Used for Field Base Maps
2. Drafts Sectors on USGS Quads

B PRODUCES SECTOR BASE MAPS

1. Enlarges USGS Quad to Appropriate Scale for Each Sector
2. Drafts Final Environmental/Visual Sensitivity Data for Each Sector
3. Adds Disturbances Indicated by Remote Sensing Aerial Photography
4. Makes Two Mylar Copies of Base Map, One Showing Disturbances & One without Disturbances to be Used as Field Base Map

C CONDUCTS FIELD INVENTORIES

1. Verifies Existing Conditions with Disturbance Base Map
2. Drafts Existing Disturbances on Final Base Map

Figure 16
CARTOGRAPHIC FLOW CHART

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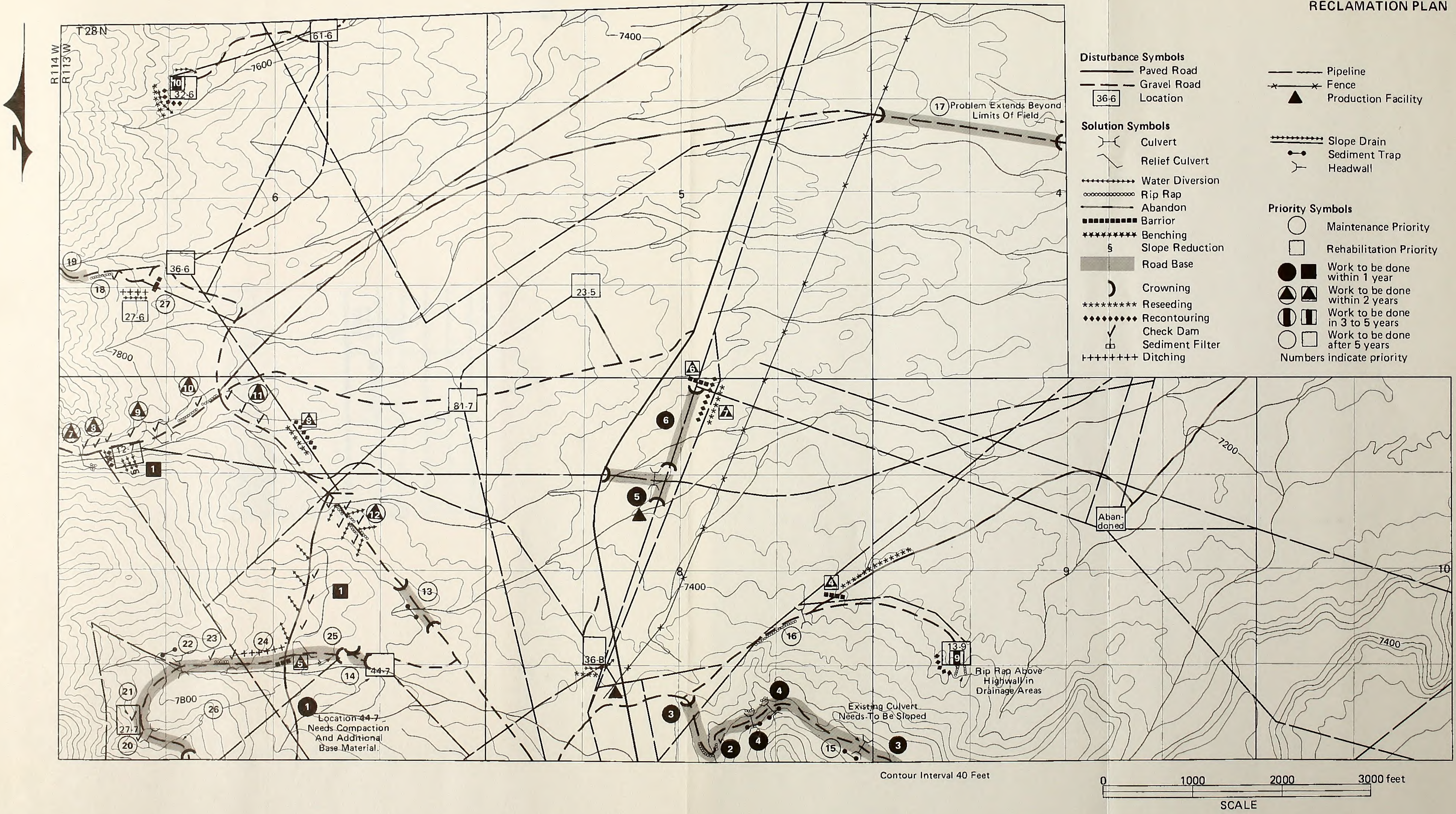
Map 12
RECLAMATION PLAN



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